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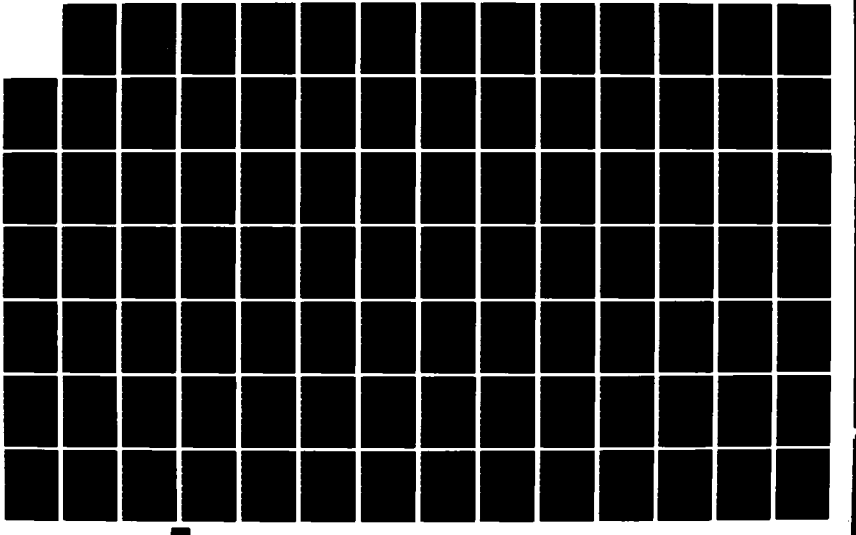

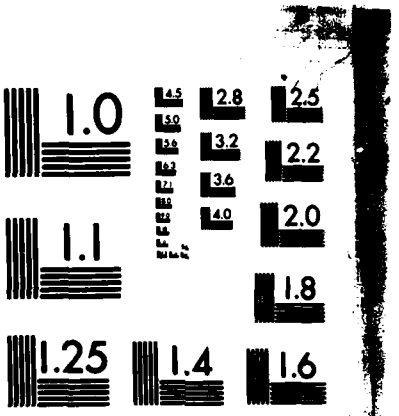

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COMPUTER ASSISTED SCHEDULING FOR AIR FORCE TACTICAL FIGHTER SQUADRONS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

BRIAN C. DUGLE, MAJ, USAF
B.M.E., General Motors Institute, 1968
M.B.A. in Aviation, Embry-Riddle Aeronautical University, 1982

Fort Leavenworth, Kansas
1983

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This project develops an algorithm modeling part of the squadron scheduling function. The thesis includes a description of the scheduling function, brief descriptions of some work previously published on computer aids to scheduling, and describes the approach taken in developing the algorithm. The bulk of the thesis is a listing of the programs written to demonstrate the algorithm. The programs are written in Microsft BASIC-80, version 5.21, which is compatible with the Cromemco microcomputers supplied

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CHAPTER 1

INTRODUCTION

Background

The most difficult and time consuming task in any flying squadron is scheduling. This job is performed by one or more crewmembers as an additional duty. It requires matching the training requirements of between 40 and several hundred individuals, depending on the type unit, with a schedule of available training assets. These consist of aircraft, flying routes, training areas, ground scoring sites, and numerous ground training events.

A typical fighter squadron today might support training of 40 pilots. Often less than half are available to fill the 16 to 24 sorties flown each day. In addition, some of the pilots are required to fill "duties" such as Runway Supervisory Unit (RSU) officer, Squadron Duty Officer, or Supervisor of Flying (SOF). Alert duty, meetings and appointments must also fit into the schedule.

Many of the squadron pilots have duty positions outside the squadron building or have "additional duties" that take up most of their time. A typical 1- or 2-hour flight itself takes up five to six hours when briefing and debriefing times are included. Flying is considered a

relatively hazardous job; safety considerations dictate a limit to the length of duty in a day which includes flying and a minimum amount of "crew rest" prior to filling flying duties on a subsequent day. Most of the training missions and events have currency or recency restrictions associated with them for much the same reasons. Under some conditions a pilot is restricted to a syllabus or specific order of missions with subsequent flights depending on successful completion of a previous training sortie.

These many factors and constraints make it difficult to devise a schedule that fits, much less one that is optimized. Schedulers often work extremely long hours without much job satisfaction. Operations Officers are generally responsible for the scheduler's product and spend even longer hours reviewing and revising what the scheduler has done.

Problem Statement

Scheduling in a flying unit is highly complex, subject to error, and makes less than optimum use of training resources resulting in discouraged schedulers and reduced combat readiness.

Hypothesis Statement

It is hypothesized that it is possible to aid the scheduler by modeling the scheduling function on a microcomputer and by helping to create alternative schedules. Such a program model must work on the equipment now being deliv-

ered to Air Force fighter squadrons: a Cromemco System 2 using an 8-bit Z-80A microprocessor with the CDOS operating system, two 380 KByte floppy diskette drives, a 5 MByte hard disk, a Zenith Z-19 terminal, a dot matrix or letter quality printer, a modem, and the Microsoft BASIC programming language, version 5[1]. The program algorithm must consider all relevant factors or it is unlikely to be used. The system must be flexible to allow for major and minor changes to requirements, availability, and objectives.

Purpose

The purpose of this research is to develop an algorithm to model the squadron scheduling function in sufficient detail to make the product useful. The major difficulty is that the problem is complex, the sources of data diverse, and the guidance subject to many levels of interpretation and emphasis. The goal is to define the logical structure of the scheduling function and translate it into code usable by the available hardware. Initially, the program is to be specifically designed for the F-15 squadrons

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[1]This description was obtained from Maj Dave Smith, Wing Training Officer of the 1st Tactical Fighter Wing, Langely AFB, VA. His wing is one of the first to receive this hardware and will help to evaluate the programs resulting from this project. The terms "KByte" and "MByte" refer to 1024 and 1,048,576 bytes of mass storage capacity respectively. A byte is one character (eight bits) of data on this system; each byte can have 256 different values (2^8). These values can be interpreted differently in different context which allows flexibility to represent nearly anything.

of Tactical Air Command (TAC) in the continental United States (CONUS) and United States Air Forces in Europe (USAFE). The basic ideas may be expanded to a more general form applicable to other fighter units.

The F-15 unit provides a good starting point for several reasons. The squadron consists only of pilots (single-seat aircraft) which reduces the level of model complexity. The mission includes one major type of flying (Air Superiority) rather than several. Perhaps most important the author's recent experience is with F-15 units which makes their problems more familiar.

Organization

Chapter 2 contains a brief review of some other systems applying computers to the problem of scheduling. Chapter 3 is a description of the model developed in this project. Chapter 4 is a brief guide to its application in the typical fighter squadron. Chapter 5 concludes with a discussion of a system envisioned at the start of this project and recommends areas for further research. Annex A is review of the myriad requirements limiting the scheduler's options such as Air Force flying regulations and manuals and regulations governing scheduling. Annex B covers the storage formats available for the data required to make scheduling decisions. Annex C includes the listings of the programs developed during this project.

CHAPTER 2

REVIEW OF LITERATURE

Information Search

A review of the literature on computer assisted scheduling indicates that anyone currently working on the subject has declined to write about it. Very limited references were found in the Defense Technical Information Center database, the library card catalogs, or in the indexes to various periodicals including the papers written at Maxwell AFB[1]. None of these indicated specific work on using microcomputers to aid the scheduler.

One of the few references found includes a very general paper written by Major Richard Strunk submitted as a reserch project to the Air command and Staff College in April, 1977. Some material published on an uncompleted project for the Strategic Air Command as a part of United States Air Force Project Rand represents in-depth study of the subject in a different context. A thesis written by an Air Force officer attending CGSC in 1980 covers a different aspect of the subject. Further digging has uncovered some other work done by industrious individuals which has been

[1]Location of the Air War College and the Air Command and Staff College.

described in conversation with the authors but which has not been formally documented for publication.

Computerizing TAC Scheduling

As noted above, the research project prepared by Major Strunk is somewhat general[2]. He stated his objective was to develop and evaluate a Computer Assisted Scheduling Program in order to answer the question, "Can Tactical Air Command (TAC) Operations be computer scheduled?" He described some factors that go into determining how this might be done including a very elaborate flow chart for a series of scheduling programs. The flowchart is 22 pages long and quite detailed. In his concluding chapter, Major Strunk admitted that he was not a computer programmer; his evaluation of the ability to have a computer schedule TAC operations was to state that his flowchart showed it could be done. A portion of the flowcharted program was coded in BASIC, but he observed that it was far from satisfactory in that form.

A Rand Study

Dr. Morton B. Berman of the Rand Corporation spent two years reserching and writing a series of reports on a very ambitious project for the Strategic Air Command (SAC)[3].

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[2]Richard R. Strunk, Can TAC Operations be Computer Scheduled? (Maxwell AFB, AL: ACSC, 1977).

[3]Morton B. Berman, The DOSS Prototype. (Santa Monica, CA: Rand Corporation, #WN-9484-PR, 1976, and

A great deal of this time was spent observing flying and maintenance activities and procedures at several SAC bases to gather data on the problem of resource allocations. The last paper published (in 1976) was originally intended only as an interim progress report on development of a Decision Oriented Scheduling System (DOSS) Prototype.

According to the preliminary conclusions and experiences of those using the prototype system, it had great promise. Dr. Berman saw some significant problems ahead but the project was shelved due to a lack of funds before he could complete his work. He stated that his opinion was use of a large mainframe computer (all that was avilable for his project) was somewhat cumbersome for this type work. He also voiced the opinion that the problem of scheduling in Tactical Air Command type fighter units was much more difficult and involved that in Strategic Air Command, where his work was done[4].

This difference is one of scope and scale; Dr. Berman's prototype system involved all aspects of both Operations and Maintenance scheduling. This is a more manageable problem in SAC due to the far fewer flights per aircraft per day as compared to fighter operations.

Scheduling Aircrews and Aircraft: Problems of Resource Allocation in the Strategic Air Command. (Santa Monica: Rand Corporation, #R-1610-PR, 1975).

[4]Telephone conversation with Dr. Berman, 13 October 1982.

Application of Linear Programming

Major Carlton L. Pannell submitted a thesis to CGSC entitled A LINEAR PROGRAMMING APPLICATION TO AIRCREW SCHEDULING[5]. The primary thrust of his application was to optimize the distribution of training assets based on scores achieved on the bombing range and a supervisor's subjective evaluation. A section of the thesis was devoted to the specific problem of building and deconflicting a weekly schedule, but not in the detail attempted by this project.

A System Now In Use

The Colorado Air National Guard flying A-7D aircraft (a type of fighter) out of Buckley Field has developed a system that has been working for about four years[6]. The National Guard has unique problems due to the part time nature of many of their personnel and their consequent severely constrained availability. These same factors make it more difficult for them to throw "manhours" at a job (such as scheduling) and live with it, so Major Ron Germano was given the funds to acquire the services of a time-shared mainframe computer to help with scheduling and maintaining records on the pilots of his unit.

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[5]Carlton L. Pannell, Major, USAF. A LINEAR PROGRAMMING APPLICATION TO AIRCREW SCHEDULING. (Ft. Leavenworth, KS: CGSC, 1980).

[6]Telephone conversation with Maj Ron Germano, 162d TFS, Buckley Field, CO, 12 October 1982.

He used an established database files structure (supplied as part of the software available with the time-shared system) to store a large volume of information. The accessing methods available with this system allowed him to search for and link data in different data files. Major Germano's program applies arbitrary values or weights to currency and recency data and current training accomplishments data on each pilot and lists the pilot's relative priority for a particular type of training.

The currency and recency items are based on guidance from the various regulations and manuals covering the training required for each category of pilot. The relative weights come from priorities established by the Operations Officer and Commander. Using the priority lists thus developed, the program can then fill a "shell" or listing of the available training missions for a given week.

This system is currently in use, although it is constantly being updated. The product is currently used as a starting point then "hand massaged" to accomodate other constraints. He characterized the accessing language provided for use in manipulating the data stored by the time-shared system as "like Pascal"[7]. With the capabilities of

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[7]Pascal is a high-level structured language developed by Dr. Niklaus Wirth of Institut fuer Informatik, ETH Zurich, Switzerland. See Kathleen Jensen and Niklaus Wirth, PASCAL: User Manual and Report: 2d ed, (New York: Springer-Verlag, 1974, corrected printing 1978), and Grogono, Peter. Programming in Pascal: Revised Edition, (Reading, MA: Addison-Wesley, 1980, 1978). Structured programming is also

this language, Major Germano has been able to devlop a program which stores the relevant data to make scheduling decision, to assign some factors or values which reflect the guidance of his bosses and higher headquarters on what is acceptable, and to produce a beginning schedule from it.

Summary

The approaches of the systems introduced above vary from that of this project in many ways. With the possible exception of the system being employed by the National Guard unit, little attempt was made to faithfully model the actions of the human scheduler. Deconfliction is the single biggest problem for the human scheduler; it is very difficult to remember every detail about the availability and conflicts of 40 individual pilots. This appears to be the greatest potential contribution of this project.

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covered by Brian W. Kernighan, and P. J. Plauger. The Elements of Programming Style: 2d ed (New York: McGraw-Hill, 1978, 1974). The significance of structured programming is its emphasis on "top-down" or big to little structure and the resulting understandability of the code. This concept is one that will be applied in this project.

CHAPTER 3

MODEL DESCRIPTION

Requirement

The requirement of this project is to develop an algorithm modeling the Tactical Fighter Squadron scheduler. This might be done at several different levels of complextiy or fidelity; it will be developed here in the simple form including only the pure scheduling function of deconfliction.

Annex A includes specific data used daily by the scheduler and training officer in the typical fighter squadron. Of this data, qualification, availability, and currency are the factors of immediate concern to the scheduler. Since this project is modeling the scheduling function, these are the factors considered.

Qualification

Every scheduled activity includes certain qualification requirements. For an ACBT mission, for instance, the pilot must be qualified for air combat training missions, and must be a flight leader under some conditions. A pilot upgrading to flight lead status would require an IP (Instructor Pilot) or a squadron supervisor on his wing. This

illustrates that each pilot has qualification attributes and each activity on the schedule has qualification requirements.

Availability

Pilots are tasked regularly with meetings, associated with either primary or additional duties, with individual training needs, and with such things as dental appointments and annual physicals. Scheduling coordination for these activities is often made individually with the outside organization involved, either by the pilot himself or by the squadron scheduling or training personnel. Once a pilot is scheduled for such an activity, his availability for normal daily or weekly duties and training missions is restricted. Each activity on the schedule has a scheduled time with attendant time requirements for some period before and after the scheduled time. Any pilot with other commitments any time during the activity period is not available as a candidate to fill that activity. Thus, the activity has an associated required availability period and the pilot has an attribute of available or not available during it.

Currency

Currency restrictions arise primarily from the need for regular practice of flying skills. Inexperienced pilots are often given shorter currency periods than experienced pilots, as shown in Annex A. Leave, extended periods of bad

weather, and other conflicts make it common for a few pilots to be out of currency at any given time. Regaining currencies such as landing, ACBT, or low level intercepts are not too difficult, generally requiring a flight under the supervision of an instructor pilot or a squadron supervisor. One goal of scheduling is to reduce the number of recurrency flights to a minimum to preserve scarce squadron training resources. Again, each activity has associated currency requirements and each pilot has currency attributes.

The Deconfliction Model

At the most simple level, the scheduling algorithm must accomplish "deconfliction". This is the process of making certain no pilot is scheduled for incompatible activities at the same time and that each pilot is qualified and current (or has the required supervision) for the activity scheduled. Further, the process must insure that each activity has someone assigned to do it. In mathematical terms, this model may be described as follows.

Let $\{S_{ij}, 1 <= i <= 48, 1 <= j <= 7\}$ be a period of time. S_{ij} is the i^{th} half-hour on the j^{th} day of the week and the $\{S_{ij}\}$ refers to a single type of training. In particular, let $\{S_{ij}\}_k$ be the shell slice for the k^{th} activity of K possible types of activities.

Let S_{ijk} be the full shell for all $1 <= k <= K$ type

activities to be scheduled.

The problem is to assign the pilots to the shell $\{S_{ijk}\}$, subject to pilot constraints, pilot availability, and the requirements of activity k.

Let f be a function on the elements of the shell S_{ijk} such that $S_{ijk} = \emptyset$ if no pilot is assigned and $S_{ijk} = -1$ if a pilot is assigned.

Thus we want to minimize

$$\sum_{k=1}^{K} \sum_{j=1}^{7} \sum_{i=1}^{48} f(S_{ijk})$$

or, since the day of the week is irrelevant and all half-hour periods are equivalent,

$$\min \sum_{k=1}^{K} \sum_{i=1}^{336} f(S_{ik})$$

where S_{ik} is the k^{th} activity to be scheduled during the i^{th} half-hour period.

This description of the model shows its simplification to the most basic level of scheduling, that is deconfliction alone. Beyond this point, guidance from the Operations Officer and information from the training section may be used to optimize the training outcome of the scheduled activities. For purposes of this project, only the fit of qualified, available pilots and their currency status will be considered.

Model Capabilities and Limitations

Effective application of the program using this model should reduce the "busy work" and oversights of the scheduler tremendously. The price paid for this aid is that the data used by the system must be kept up-to-date. Qualification data changes least often and could be updated weekly. Availability and currency data must be updated daily if the information is to be of any use.

The deconfliction model is based on the weekly schedule cycle and is updated daily during the execution of the schedule. The program presents candidates for each schedule activity who have the required attributes of qualification and availability and shows if they are current or not. This should allow the scheduler to base his choice on factors outside the model to achieve further training effectiveness.

Summary

Given good data from which to make selections and the speed, responsiveness, and accuracy of operation of the microcomputer, the scheduler's job should become one of selecting the "best" candidate for an activity rather than "a" candidate who seems to fit.

CHAPTER 4

APPLICATION OF THE DECONFLICTION PROGRAM

The program listing included at Annex C is written to apply to a typical single-mission, single-seat fighter squadron. The concept could be expanded to cover broader applications but time constraints precluded that in this project.

Application of the model to the typical scheduling operation should be primarily oriented to the weekly scheduling cycle. Entry of the "shell" and production of multiple weekly data files and schedule files should allow some progress towards optimization beyond the deconfliction model of the program. This chapter will discuss use of the program.

Starting Out

A learning period must be expected before good availability data will be routinely provided to the system. This will require a policy that, after a certain date in the implementation process, scheduling decisions will be based only on data actually provided to the system. Such a "hard line" attitude will be instrumental in getting good availability data into the system at an early stage. This data

must often come from the pilot himself because most availability data generated by the system will be managed internally. Thus, the learning period involves all squadron personnel.

This availability data is one part of the information stored in individual pilot data files. These are sequential files in ASCII[1] character form so that they can be inspected with a simple text editor. A utility with prompts for the information in the proper format is also provided. These files are sequential access files for compactness; their individual nature makes access time a minor consideration, especially with speed of a hard disk.

All other information required for proper operation of the system should come from within the scheduling section. This includes other data contained in the individual pilot files such as name, service number (SSAN), and other administrative data, and qualification and currency data. The qualification names are user definable and may be expanded to much larger capacity than the fifteen slots provided. Each qualification attribute is a "yes" or "no", that is, training or upgrade status qualifications must be handled by a separate qualification name.

Currency data is included in ASCII character form also, but is in Julian date format including a year digit.

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[1]See Annex B, DATA DEFINITION AND STORAGE, for more explanation on this subject.

This allows easy conversion within the program to a form suitable for comparison with the schedule activity date. Since some currency periods are within the normal scheduling cycle, currency status is provided to the scheduler but is not used as a filter for selecting the candidates for a given activity.

System Operation

Once the pilot data files have been developed, the scheduler must begin entering the weekly schedule shell. This will include all activities for which the squadron must provide pilots. Some of these may be a standard set of duties (for example, SOF, RSU, Alert, and so on) that will be required on a regular or rotating basis. Most flights and ground training events will have to be entered individually each week. All shell data will stored in a single file for the week including the activity code, the activity time as hours and minutes of the day, the start and end of the activty time period in minutes from the week beginning, and the pilot code if one has been assigned in advance.

Once the shell is complete and the pilot data is available, the scheduler may make any number of attempts at filling the schedule. Each iteration will start with a schedule data file built from the shell data and the pilot data files. Once it has been made, it may be copied and a sequence number assigned to distinguish it from others.

The weekly schedule data file includes pilot

qualification, availability, and currency data in a compact matrix form for quick manipulation by the program. A random access file format aids this speed and ease of access. Also included is the data from the shell on each activity and a matrix of which pilots are qualified and available.

Building a trial schedule requires the scheduler to select an activity to fill, check the candidates provided by the system against outside priorities, and make a tentative selection. After each selection the program must update that pilot's availability data and the pilot availability data for any activities affected by this selection. A flag is provided if the current selection results in the number of candidates for another activity dropping to zero. This condition may be alleviated by using resources outside the squadron or by "un-selecting" that pilot and making another choice. This mechanism provides for minimizing the schedule filling function described in chapter 3.

Once the schedule is completed, an alternate schedule may be developed or this one may be made firm. The firm schedule selected may be used to update the pilot availability data files so that a historic record of all scheduled activity is maintained. This may require periodic purging of old data to keep file sizes and access times acceptable.

Daily Update

The firm schedule will be selected at the time determined by the local scheduling cycle. Once firmed up,

it must continue to be updated with currency information, as well as with any changes made in activities. Since all qualification, currency and availability data for the week is included in the weekly data file, it must be specifically kept up-to-date as pilots accomplish events or sorties which change their status.

If a selection was made based on anticipated events that did not transpire, a check of currency and qualification status on a daily basis will find the problem. Since all availability data and currencies are accessed, the system can be used to find an alternate candidate for the activity or to change the supervision provided.

Summary

Use of the system developed during this project should allow the scheduler to spend his time more productively, resulting in fewer oversight errors and the opportunity to optimize other factors not included in the program. This may result in a higher quality product rather than just a schedule that satisfices.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The initial goal of this project was to develop a program that would automatically produce a schedule. Several factors made this goal impossible to achieve, the biggest of which was time. This chapter will describe some of the thoughts developed towards this goal so that others working on similar projects may get some insight. In addition, some suggestions are made about the programming language.

The scheduling function is almost inextricably linked with training in a typical fighter squadron. The program developed in this project includes some overlap into the area of training in keeping track of currencies and qualifications. A program that successfully produces a complete schedule will need much more training type information. This data will include much of that described in Annex A, the requirements of TACM 51-50. This must be carefully integrated into the real world system of official Air Force record keeping so that duplication of effort is avoided. This will require retrieval of the official data from its storage medium, usually the base level main frame computer, and operation based on what is stored there.

An alternative is to store the training

accomplishment data on the microcomputer hard disk and supply the base level equipment from there. This could pose some data security problems and is not likely to be approved.

Updating the base level system could be done with the help of a communications package and the modem over normal telephone lines. If two-way data flow could be established with proper safe guards for quality checking on the data sent to the main frame, the microcomputer system could have access to current, accurate training data.

Given this access, further programs could be developed which would allow the computation of the number of requirements remaining for each pilot, in each category of training, and this data could be used to prioritize who would be automatically selected for a given sortie. The priority basis should take into account not only requirements remaining, but also the opportunities remaining to accomplish those requirements. A quotient of remaining divided by opportunities would produce a fractional number which would contain this relative value.

The priority established for one person to use a sortie might have relatively little to do with a different need by another for the same activity. For instance, one pilot might require an ACBT sortie for training while another required it for currency. The decision on who needed it might be based on subjective data or data not available

to the microcomputer, but this could be simulated by applying a weight factor to each persons need. This weight factor would then be the means of providing differing strategies of schedule filling for the program. One strategy weighting currency very heavily might result in a totally different product than another which weighted training needs more heavily.

Another area for further research is the language used in developing this program. Interpreted BASIC is relatively slow compared to some other languages, and its structure allows rather poor programming practices. This has been avoided as much as possible during this project but no doubt has crept in. The need for an easily understood program in this instance, as in many cases, is the need many users will find to change it, whether slightly or greatly. Even a well written program will take many hours of study to become familiar with the author's pattern or structure. A poorly written program may be totally undecipherable even to the author in six months time. Conversion of the basic ideas of this program into another language such as Pascal or Modula 2, a new language introduced by Dr. Niklaus Wirth, could prove very beneficial in the future[1].

The other possibility for increasing the speed of this program would be to compile it into machine code. The producer of this dialect of BASIC, Microsoft Corporation,

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[1]See Annex B for more information on programming.

has a compiler for it. However, the compiler places further limitations on the structure available; the program included here was not written within these limitations.

Thus, there are three recommendations: expand the project to include the training data needed to produce a schedule automatically; write the code in a better, faster language; or modify the code to allow compiling it for greater speed.

ANNEXES

ANNEX A

TRAINING REQUIREMENTS AND THE SCHEDULING SYSTEM

Introduction

Training is normally considered to be a separate functional area within the staff structure of a fighter squadron, however, the training requirements of each individual are what drive the formation of the schedule. This annex will describe the requirements levied in TAC MANUAL 51-50[1] and the resulting scheduling decisions that a algorithm must model faithfully.

This project has been limited to the goal of developing the scheduling algorithm, but the data needed to make effective decisions for scheduling will in many cases be identical to that needed for planning by both schedulers and the training staff. Some of this data must be stored in official Air Force records such as Air Force Technical Order (AFTO) form 781, Aerospace Vehicle Flight Data Document, in Flight Records, and either TAC Automated Flying Training Management System (TAFTRAMS) or Air Force Operations Management System (AFORMS). The latter, AFORMS, is to be a

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[1]DEPARTMENT OF THE AIR FORCE, Headquarters Tactical Air Command, FLYING TRAINING: TACTICAL FIGHTER/RECONNAISSANCE AIRCREW TRAINING. TAC MANUAL 51-50, Volume I, 26 October 1981.

universal training and flight data system which all units will eventually use. For these reasons, the implementation of the algorithm devised in this project must be consistent with the basic information format and needs of these systems or the goal of usefulness will not be met.

Another impact of the training manual requirements on the scheduling system is the need to forecast the specific needs of the unit as a whole. Although this is again normally a training staff function, the scheduler is often in the middle of the process because of his direct use of the results.

Graduated Combat Capability

TACM 51-50[2] is based on the concept that the unit commander, normally the squadron commander, has the best knowledge of the specific training needs of his pilots. The Graduated Combat Capability (GCC) system gives him the ability to assign training assets to achieve various levels of capability depending on the amount of those assets and the experience and individual ability of his people. Volume I of the manual is common to the three Tactical Air Force (TAF) Major Commands (MAJCOMs), TAC, USAFE, and PACAF. Chapter 6 of Volume I is written by each of the MAJCOMs to

[2]Abbreviations for the manuals in this chapter will be: TACM 51-50 for reference to the whole series of volumes, Volume I for that specific volume exclusive of the MAJCOM chapter, TAC Chapter 6 or USAFE Chapter 6 for their respective chapters, and Volume VII for the F-15 specific volume.

reflect the individual needs of the theater and mission, and applies to all types of fighters in each MAJCOMs inventory. The subsequent volumes of TACM 51-50 reflect the training requirements unique to the specific aircraft. Volume VII includes this information for the F-15.

The training of all aircrew members is broken down into three basic phases by TACM 51-50. IQT is the Initial Qualification Training phase and is normally completed at an RTU or Replacement Training Unit. There are occaisions when an operational unit must "train from scratch", but they are kept to a minimum.

MQT is the Mission Qualification Training phase that leads to the first or lowest level of Mission Ready (MR) status. MQT is accomplished in part at the RTU and completed at the gaining operational unit. An aircrew completing MQT at his unit is qualified at level A of the unit Designed Operational Capability (DOC) and can effectively accomplish the units basic mission.

The final type training covered in TACM 51-50 is CT, Continuation Training. This is the day-to-day training accomplished by all the squadron pilots to maintain their mission proficiency or to advance to a higher level. The squadron scheduler is concerned with the requirements of MQT and CT training and the many upgrade programs that fall in these areas. The algorithm modeling the scheduler must allow for making decisions based on diverse requirements of

these programs.

General Requirements

The flying training requirements of Volume I are specified in Table 3-1:

6	penetrations (instrument flying)
12	precision approaches
12	non-precision approaches
2	night landings
3	air-to-air refuelings (AAR)
2	night sorties (credited if 1 hour or 60% of the flight was during darkness)
30	minimum total sorties

These requirements apply to all fighter aircraft training regardless of the specific type (albeit with some exceptions) but do not address the training needs of specific missions. The specified training must be accomplished during each training cycle; these are defined as six-month periods beginning 1 January and 1 July. Additional requirements of Volume I include Annual Instrument and Mission or Tactical Qualification evaluation flights and associated examinations, Aircrew Weapons and Tactics Academics, and Target Area Certification or Verification. Rules and supporting tables are provided for prorating training requirements of arriving or departing personnel (who are available only part of the training period) or for other contingencies.

Certain reports of individual and unit capability status are based on the number of sorties flown each month by the squadrons pilots. Since the scheduler is the primary planner of sorties, the sustainability of a given sortie rate is within his purview even though the report itself is normally prepared by the training staff. This reporting philosophy is specified in Volume I. Also included are various definitions of types of training sorties, only one of which can be accomplished per flight, and events of which several may be accomplished.

MAJCOM Requirements

The final chapter of Volume I is written individually by each of the TAF MAJCOMs. This project is involved with two of these: TAC Chapter 6, TAC AND ARF[3] AIRCREW TRAINING[4] and USAFE Chapter 6, TACTICAL FIGHTER/RECONNAISSANCE AIRCREW TRAINING[5]. These additions are applicable to all types of fighters but specific to the command of their assignment.

TAC's Chapter 6 specifies the type of training data

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[3]ARF is Air Reserve Forces, both Air National Guard and US Air Force Reserve.

[4]DEPARTMENT OF THE AIR FORCE, Headquarters Tactical Air Command, TAC AND ARF TRAINING: FIGHTER AND RECONNAISSANCE. TACM 51-50 Volume I, Chapter 6, 15 February 1982.

[5]DEPARTMENT OF THE AIR FORCE, Headquarters United States Air Forces in Europe, Flying Training: TACTICAL FIGHTER/RECONNAISSANCE AIRCREW TRAINING. USAFE Chapter 6 to TACM 51-50, Volume I, 1 October 1982.

that must be tracked if the unit does not have TAFTRAMS or AFORMS available. This data is basically that which is needed to make scheduling decisions. It includes:

Unit sorties required and accomplished

Individual sortie standards

Requirements and accomplishments for each assigned GCC level

Totals for each month for the semi-annual training period

Individual monthly flying time accomplished

Individual required events accomplished

Individual weapon delivery data on events required for MR qualification[6]

TAC Chapter 6 also defines the types of ground training in three categories: Category I - Mission Essential, Category II - General Flying Related, and Category III - Other Training Related to Aircrews. This training must also be scheduled and affects availability both during conduct of the training and by its effect on crew rest.

Additional training guidance included in this document covers instrument training requirements, the composition of Realistic Training Sorties, Red Flag or equivalent training, Chemical Warfare Defense (CWD) training (in the aircraft and simulator), instructor currency and minimums, and additional TAC semi-annual requirements. These requirements consist of:

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[6]TAC Chapter 6, p. 6-3.

EC (electronic combat) events	12
Instrument sorties (inexperienced pilots)	2
Night AAR	1
No HUD (head up display) approaches: one-half of Table 3-1 requirements	
Formation Takeoffs	4
CW (chemical warfare) Exercise	1 annually[7]

TAC Chapter 6 specifies the following as goals:

Red Flag participation	1 annually
Formation events:	
Day Takeoff	12
Night Takeoff	2
Day Landing	3
Departure (wing)	6
Approach (wing)	6[8]

Table 6-12 covers another subject basic to design of a successful scheduling algorithm, currencies. The following list is excerpted from that table leaving out some of the complicating qualifiers that do not apply to the F-15 aircraft or pilots.

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[7]TAC Chapter 6, Table 6-1Ø, p. 6-39

[8]TAC Chapter 6, Table 6-11, p. 6-39

Accomplishment (Event/Sortie)	Inexperienced Pilot	Experienced Pilot
Day Landing	30 days	45 days
Night Landing	15	30
AAR (Day or Night)	Six Months	
ACBT (Air Combat Training)	90	90
Formation Events		
Takeoff (Day or Night)	60	90
Day Landing	60	90
Low Level Flying	60	90
IP Rear Seat Landing		30
IP Instruction Flight		60
Dart	18 Months	

These requirements are constraints or considerations that must be taken into account by the scheduling algorithm being developed. These may be different than those imposed by another command and may vary further depending on the specific type aircraft.

USAFE Chapter 6 has similar type information but the currency numbers vary, different categories are defined, and some guidance is much more specific. Paragraph 6-24 requires inexperienced pilots to fly a non-demanding sortie if they have not flown within 22 to 30 days and requires the same of experienced pilots who have not flown for 31 to 45 days. The experience levels are defined in Volume I and the

non-demanding category is explained in paragraph 6-23 of USAFE Chapter 6.

Other currencies specified in the USAFE chapter include regaining landing currency after varying periods, night landing, air refueling, wing formation landings, precision approaches, rear seat landing for instructors, and flights while wearing CWD gear. Each of the type events and sorties required later in the chapter are defined in paragraph 6-25. For the F-15, Table A3-1 specifies the training requirements for maintaining the various levels of GCC qualification. Some are defined as guidelines under some conditions, but they are essentially required for purposes of the scheduling algorithm.

GCC Level Sorties

Level:	A	B	C
Total (Inex/Exp)	40/36	68/60	82/70
1 month GCC rate	7/6	12/10	14/12
3 month GCC rate	20/18	34/30	41/35

Weapons Events (Required)

Dart		Qual	
Gun Tracking	6	12	18
WSEP[9]		1 (sortie)	

[9]WSEP is Weapons System Evaluation Program.

GCC Events

Intercepts	20/16	26/22	32/28
ECCM[10]	2	4	6
Alert Scramble	2	3	4
Integrated Msn/Joint Ex	1	2	3
Comm Jam	2	4	6
ACBT Sorties	31/27	43/37	50/42
BFM/DBFM[11] Sorties	2	2	2
Instrument/Proficiency Sorties	2	4	4
AAR	3	3	3
Captive AIM-9	6	8	10
CWD Sorties	1	1	1
ACMI[12] Sorties	4	6	8

F-15 AIRCREW TRAINING

Volume VII[13] of the series is specific to the F-15 aircraft. Paragraph 2-9 lists minimum sorties and events to be accomplished during MQT, often a level of training the scheduler must be concerned with. Chapter 3 includes the

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[10]ECCM is Electronic Counter Countermeasures.

[11]BFM is Basic Fighter Maneuvers, DBFM is the same mission flown with dissimilar aircraft.

[12]ACMI is the Air Combat Maneuvering Instrumentation, a realistic training enhancement.

[13]DEPARTMENT OF THE AIR FORCE, Headquarters Tactical Air Command, Flying Training: F-15 AIRCREW TRAINING. TAC MANUAL 51-50, Volume VII, 26 March 1982.

minimum number of simulator hours required for each training period, among other items.

Summary

This annex has shown some of the sources and numbers that the scheduling algorithm must be capable of handling. Of more significance than the numbers is their variation depending on the situation. A given scheduler has essentially the same type problems as any other but the specifics of requirements vary widely depending on location, experience level of the pilots, weather affecting the base, and maintenance capability currently enjoyed. The algorithm must be able to take such diverse factors into account and simulate the many small decisions the human scheduler would normally make largely on intuition and produce a product--the schedule. Its success will lie, if it is successful, in making its programmed decisions without forgetting the details that sometimes escape the human scheduler in his flury of work.

ANNEX B

DATA DEFINITION AND STORAGE

The previous annex showed the sources and types of data required by the algorithm to make programmed "decisions". The significant factors are the variety and variation of these data from one location to another. The user will have to be able to define and redefine data storage parameters as the system is used, both to initialize it and to react to changes in guidance or regulations. This annex will describe the way different data types may be assigned by the user and the general types of data the algorithm must be able to access and manipulate.

Data Types

A microcomputer actually stores only one representation of data--the byte. A byte is defined as eight bits, each of which can have the value "on" or "off". The context in which a given byte is presented to the microprocessor determines how it will be interpreted. Several general types are available in Microsoft BASIC[1], including string or character, integer, and single or double precision real variables. Characters are stored with one byte used for

[1]Trade Mark of Microsoft Corp., Bellevue, WA.

each letter, digit of a number, or special code. This code is called ASCII, for American Standard Code for Information Interchange. Seven bits of each byte are used in this code which results in 2^7 or 128 possible meanings. The eighth bit may be left blank or it may be used for a parity check on the other seven bits. In some systems the eighth bit is used to define another 128 characters used for graphics. Integers are stored in two consecutive bytes and may have the value -32768 to 32767. The number 32767 is 2^{15} less one--the two bytes are interpreted as a binary number with the most significant, or sixteenth, bit used as a "sign" bit. Note the difference in representing the number 32767 in ASCII or as an integer: ASCII requires five bytes while the binary form requires only two.

Real numbers, those that can have fractional values, are stored in either four or eight bytes as single or double precision variables. Single precision can represent numbers to six significant figures while double represents sixteen significant figures. Since these numbers are stored in binary format, the fractional portion is subject to a very small error when converting to and from decimal[2].

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[2]This is not a problem in most applications but must be considered if the result of a calculation is based on the difference of two numbers, especially if the result is at or near the limit of the number's precision. The most common example of this type difficulty is in interest calculations for accounting applications; daily interest numbers can be very small but are used in long iterations which compound a very small error into a significant one. Money calculations are required to balance to the penny. This fact must be

The flexibility of these data types will allow complete and compact storage of the data required by this model. Names of pilots, for instance, will be stored as a string of characters while currency dates will be stored as an integer or binary value. Storing a date as letter and number characters might seem insignificant at first glance, but seven bytes versus two becomes quite significant when storing many different dates for each of 40 or more pilots.

Defining What Is Stored

The hardware or machine and program language dependent data storage limitations will allow the application to store any type variable data that may be needed. The application program, or implementation of the scheduling algorithm, must store, access, and manipulate the data in a meaningful way. Since this will depend on many factors, including what command guidelines and regulations affect the unit, how many pilots are assigned, how many different missions must be considered, and so on, a means of storing not only the data but the meaning of the data must be devised.

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considered in the design of the algorithm, so that its effects are not significant. Number precision data is from the OSBORNE 1 User's Reference Guide by Thom Hogan and Mike Iannamico, Hayward, CA: Osborne Computer Corp., 1981, revised 2/22/82.

Data Mass Storage Media

The storage medium available for this program is called a disk; in this case either floppy or hard disk. The difference in these is mainly one of capacity and access/transfer speed, the type files that may be stored are essentially identical. A disk is a random access medium for mass storage, that is, it can be accessed directly throughout its capacity. A sequential access device, on the other hand, must read everything up to the position of the required data in order to find that data.

An example of sequential access is the cassette tape. It must be played until the desired selection is reached; it must be rewound to find specific data again. Use of the tape counter makes fast forwarding to the vicinity of a selection possible, but finding one note or word of a particular song would be difficult without listening to a complete passage.

The random access disk has the data stored on it in rings or tracks. There are many tracks so the amount of data on each is a small portion of the total. Even though the data is stored sequentially on each track, it can be found very quickly by reading the whole track or a sector of the track. Thus the disk is a good medium to have for storing the data required by this project.

Data is stored on the disk in files. Each file may include many records, each of which stores a unit of the

file. This can be visualized as each of the sheets containing responses to a questionaire. Each record is then divided up into fields, or continuing the analogy, the responses to each question on the questionaire. For this project, a file could contain records for each pilot showing his name, Social Security Account Number (SSAN), birth month, training status code, and qualifications. These divisions by pilot would be the fields, the complete data on a given pilot would be a record, and all the data on the pilots of the squadron would be a file.

Disk files themselves may be either random access or seqential access files. Sequential access files may be found directly by the storage medium, the disk, but must be read sequentially. Random access files may be accessed by individual record directly. The advantage of sequential files is their conservation of storage space--very little overhead is used in storing the information. Random access files require each record to be a consistent length, so a specific record position can be calculated. This means that if the longest name in the squadron has twenty five letters in it, even the shortest name will also effectively take up the same twenty five bytes of storage. Perhaps more significant is the new pilot whose name will not fit into the existing name field--not the best situation.

The point of this discussion is that data storage must be considered carefully so that changes can be accommo-

dated. Speed of access and active storage space within the computer must weigh against disk space available. Most significant is the ability to change the mode of storage as requirements change. This suggests the use of a file to store the meaning of the contents of another file. Allowing the user to define what, where and how the data he/she needs will be stored will make for maximum flexibility in application to varying locations, guidance and regulations.

Specific Data Types

The algorithm being developed deals with pilot's personal data, qualifications, currencies, requirements, accomplishments, and availability. Time periods may vary from three years, the longest currency period presently needed, to a few minutes. Dates may be needed in terms of days or months, or may refer to times years away. Effective manipulation of data in these forms will require a few standardizing decisions up front.

Individual name and personal data will mostly be string or individual character type. If internal data manipulation is accomplished with subscripted or array variables, then this data may most easily fit into a sequential file. Initialization of run time variables to the portions of personal data needed would be quick and accomplished only once. Prompts and other user interface messages could insert the name while manipulating the data in an array. Data such as currencies could be maintained in a list by pilot or

by the currency requirement, depending on the use being made of the data.

The basic concept of the scheduling model is that a relationship of priority exists between the number of opportunities available to accomplish a requirement and the number of those requirements that remain. Implementing this concept requires subtracting the individual pilot accomplishments from the total required for the given item. By eliminating periods that are known to be unavailable, a quotient representing the relative priority of pilots for a specific training asset can be established. If only those current and available are considered, then the pilot with the highest priority is the one assigned to use that item.

This concept will require storage of many data items at once. If the requirement is to fill a flight lead ACBT slot, for instance, the algorithm must check all pilots for flight lead status, ACBT currency, and availability during the time period of the flight. Then, assuming more than one pilot is available who fills these criteria, each pilot's priority for the ACBT flight must be calculated and compared. When the highest priority is determined, given all factors and weights to consider, that individual must then be made "not available" for the duration of the flight and the briefing and debriefing times associated with it. With that pilot's data updated for the potential flight completion and the flight itself filled, the next priority of

requirement must be examined in the same way.

Thus it becomes obvious that implementation of this algorithm requires storage of and access to availability, qualification, and currency data. A schedule is normally built on a weekly basis with names, but tentative plans may be made over longer periods. The availability data must be stored in a format allowing any degree of precision required by the situation. A month or more in advance, the scheduler may be looking at half-day time increments; he will be looking at parts of hours, perhaps minutes, when making a final daily schedule.

The concept of a file defining the use of a file makes it possible to store the standard data in a given application very compactly. The range of integer numbers allows currency data to be stored as the units digit of the year times 1000 plus the Julian date. For example, 30 January 1983 would be 3 X 1000 + 30 or 3030. Availability usually requires two times to define it, the beginning and the duration or end time. Since a training period is six months long, the day of the period times 100 plus the half-hour of the day would fit into the integer number range available[3]. This limits the resolution of the system to the half-hour block that includes the start or end time, but that may be sufficient for most long range factors.

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[3]A maximum of 184 days times 100 equals 18400, plus 24 hours in a day times 2 equals a maximum value well within the limits of integer values.

A date and time block providing one minute resolution would need four digits for the time of day and four more for the day and year. If the duration were limited in some way, it could reduce the storage space required for the end data, but using the same format reduces the complexity of coding and decoding without limiting flexibility. For instance, the system could accommodate both a 30 minute duration haircut appointment and a 179 day temporary duty (TDY) assignment without modification.

One factor to consider in currency data storage is the form of the requirement, currency dates, and the method for their comparison. At machine level, the easiest comparison is a logical AND or a subtraction. Since this is done in binary form, if the data were stored in binary also, it could have a beneficial effect on speed of operation. This type of data storage and comparison technique will be used for the availability checking routine. Numbers up to 255 in decimal, or 2^8 less one, can be compared directly this way with an eight bit microprocessor.

Summary

The data storage is driven by several factors, the machine and language capabilities, mass storage characteristics, and the nature of the information to be stored. The variations from one user environment to another will require significant user input into what information is stored and how. The general types of information will be character

strings, numbers, and dates, and their form will be the smallest that can be used consistent with the range and resolution required.

ANNEX C

PROGRAM LISTINGS

The programs listed on the following pages show the ability of a microcomputer to handle the magnitude and detail of the scheduling problem at squadron level. Several statements are included which "stub" certain routines; these were not required to demonstrate the algorithm and were not completed due to time constraints.

These programs were written on an Osborne 1 with the software included in the purchase price of that system. The listing was done on an IDS Prism 132 printer in the 10 character per inch correspondence font mode.

Any reader with intent to apply these programs to an actual scheduling job is encouraged to contact the author for a copy of the latest version on disk.

```
100       '*** CURDEF.SET ************************************
110       'program dated 16 May 1983
120       '
130       'This program sets or changes the values stored for
140       '        each currency code
150       '
160       DEFINT A-Z
170       CLR$ = CHR$(26): DOWN$ = CHR$(10)
180       MID.SCRN$ = CLR$ + STRING$(8,10)
190       DIM EVENT$(10)
200       '
210       OPEN "R", 1, "CUR.DEF", 28
220       FIELD#1, 2 AS N11$, 20 AS N12$, 2 AS N13$, 2 AS N14$
, 2 AS N15$
230       '
240       PRINT MID.SCRN$ "Enter currency code number to chang
e or 0 to quit"
250       PRINT: PRINT"What number?";: INPUT" ", CODE
260       IF CODE = 0 THEN CLOSE: END ELSE IF CODE > 15 THEN P
RINT"Error, out of range <max is 15>": GOTO 250
270       GET#1, CODE
280       CUR.CODE = CVI(N11$)
290       CUR.NAME$ = N12$
300       PER.EX = CVI(N13$)
310       PER.INX = CVI(N14$)
320       EVNT = CVI(N15$)
330       IF CUR.CODE <> CODE THEN PRINT"File error: record nu
mber not equal to currency code": PRINT"Press any key to con
tinue...";: DUMMY$ = INPUT$(1)
340       PRINT MID.SCRN$ "Current data:"
350       PRINT CUR.CODE CUR.NAME$ PER.EX PER.INX EVNT
360       PRINT
370       PRINT"  Enter:"
380       PRINT"           0 if all correct, no changes"
390       PRINT"           1 to change currency name"
400       PRINT"           2 to change experienced currency per
iod"
410       PRINT"           3 to change inexperienced period"
420       PRINT"           4 to change updating event number"
430       PRINT"  Which choice?";: A = VAL(INPUT$(1)): PRINT A
440       IF A = 0 THEN LSET N11$ = MKI$(CODE): PUT#1, CODE: G
OTO 240 ELSE IF A > 4 THEN PRINT"Error, enter a number from
0 to 4 only, try again...": GOTO 430
450       ON A GOSUB 500, 580, 640, 700
460       GOTO 340
470       '
480       '___subroutines_____________________________________
490       '
500       PRINT MID.SCRN$ CUR.CODE CUR.NAME$ PER.EX PER.INX EV
NT
510       PRINT: PRINT"What is the new currency name",: INPUT
CUR.NAME$
520       IF LEN(CUR.NAME$) > 20 THEN PRINT"Too long, only 20
characters will be saved"
530       PRINT"Enter 0 if currency name is correct, 1 to chan
```

```
qe it: ";: A = VAL(INPUT$(1)): PRINT A
540       IF A = 1 THEN GOTO 510 ELSE IF A <> 0 THEN PRINT"Err
or, 0 or 1 only, try again...": GOTO 530
550       LSET N12$ = CUR.NAME$
560       RETURN
570       '
580       PRINT MID.SCRN$ CUR.CODE CUR.NAME$ PER.EX PER.INX EV
NT
590       PRINT: PRINT"Enter the period of currency for experi
enced pilots"
600       INPUT"What is the currency period (days)? ", PER.EX
610       LSET N13$ = MKI$(PER.EX)
620       RETURN
630       '
640       PRINT MID.SCRN$ CUR.CODE CUR.NAME$ PER.EX PER.INX EV
NT
650       PRINT: PRINT"Enter the period of currency for inexpe
rienced pilots"
660       INPUT"What is the currency period (days)? ", PER.INX
670       LSET N14$ = MKI$(PER.INX)
680       RETURN
690       '
700       PRINT MID.SCRN$ CUR.CODE CUR.NAME$ PER.EX PER.INX EV
NT
710       PRINT: PRINT"Enter the event number that updates thi
s currency (? for help): "
720       INPUT"What is the event number? ", EVNT$
730       IF EVNT$ = "?" THEN GOSUB 790
740       EVNT = VAL(EVNT$)
750       IF EVNT < 1 OR EVNT > 10 THEN PRINT"Enter a number f
rom 1 to 10 only...": GOSUB 790: GOTO 740
760       LSET N15$ = MKI$(EVNT)
770       RETURN
780       '
790       OPEN "R", 2, "CUREVNT.DEF", 26
800       FIELD#2, 2 AS N21$, 20 AS N22$
810       I = 0
820       FOR I = 1 TO 10
830                 GET#2, I
840                 EVENT$(I) = N22$
850       NEXT
860       FOR I = 1 TO 10
870                 PRINT I "- " EVENT$(I)
880       NEXT
890       INPUT"Which event number? ", EVNT$
900       RETURN
```

```
100       '*** ACTDEF SET ***********************************
110       'program dated 16 May 1983
120       '
130       'This program sets or changes the values stored for
140       '        each activity code
150       '
160       DEFINT A-Z
170       CLR$ = CHR$(26): DOWN$ = CHR$(10): MID.SCRN$ = CLR$:
 FOR I = 1 TO 8: MID.SCRN$ = MID.SCRN$ + DOWN$: NEXT
180       DIM ST.T(3), END.T(3), GP$(3), CUR CAT$(15), QUAL.CA
T$(15)
190       ST.T(0) = 0: ST.T(1) = 15: ST.T(2) = 135: ST.T(3) =
165
200       END.T(0) = 0: END.T(1) = 90: END T(2) = 180: END.T(3
) = 240
210       GP$(0) = "Non-duty activities": GP$(1) = "Duty/non-f
lying activities"
220       GP$(2) = "Flying activities": GP$(3) = "Long flight
activities"
230       '
240       OPEN "R", 1, "ACT DEF", 46
250       FIELD#1, 2 AS N11$, 20 AS N12$, 2 AS N13$, 2 AS N14$
, 10 AS N15$, 10 AS N16$
260       '
270       PRINT MID SCRN$ "Enter activity code number to chang
e or 0 to quit"
280       PRINT: PRINT"What number?";: INPUT" ", CODE
290       IF CODE = 0 THEN CLOSE: END ELSE IF CODE > 255 THEN
PRINT"Error, out of range (max is 255)": GOTO 280
300       GET#1, CODE
310       ACT.CODE = CVI(N11$)
320       ACT.NAME$ = N12$
330       ST.T = CVI(N13$)
340       END T = CVI(N14$)
350       CUR$ = N15$
360       QUAL$ = N16$
370       IF ACT.CODE <> CODE THEN PRINT"File error  record nu
mber not equal to activity code": PRINT"Press any key to con
tinue...";:
DUMMY$ = INPUT$(1)
380       PRINT MID.SCRN$ "Current data:"
390       PRINT ACT.CODE ACT.NAME$ ST T END.T
400       PRINT
410       PRINT"  Enter:"
420       PRINT"           0 if all correct, no changes"
430       PRINT"           1 to change activity name"
440       PRINT"           2 to change start or end time offset
s"
450       PRINT"           3 to check currency requirements"
460       PRINT"           4 to check qualification requirement
s"
470       PRINT"  Which choice?";: A = VAL(INPUT$(1))  PRINT A
480       IF A = 0 THEN LSET N11$ = MKI$(CODE)  PUT#1, CODE: G
OTO 270 ELSE IF A > 4 THEN PRINT"Error, enter a number from
0 to 4 only.
```

```
 try again ...": GOTO 470
490       ON A GOSUB 540, 620, 790, 1030
500       GOTO 380
510       '
520       '___subroutines_____________________________________________
530       '
540       PRINT MID.SCRN$ ACT.NAME$
550       PRINT"What is the new activity name";: INPUT ACT.NAM
E$
560       IF LEN(ACT.NAME$) > 20 THEN PRINT"Too long, only 20
characters will be saved"
570       PRINT"Enter 0 if activity name is correct, 1 to chan
ge it: ";: A = VAL(INPUT$(1)): PRINT A
580       IF A = 1 THEN GOTO 460 ELSE IF A <> 0 THEN PRINT"Err
or, 0 or 1 only, try again...": GOTO 490
590       LSET N12$ = ACT.NAME$
600       RETURN
610       '
620       PRINT MID.SCRN$ "Start offset is the time before the
 activity that availability is required"
630       PRINT"End offset is the time for the activity and de
brief or travel time following"
640       J = ACT.CODE / 64
650       PRINT"This activity code group includes " GP$(J) ":"
660       PRINT ST.T(J) "is the standard number of minutes set
 for start offset"
670       PRINT END.T(J) "is the standard end offset"
680       PRINT"Enter:"
690       PRINT"  0 if the old offsets are correct"
700       PRINT"  1 to change to the standard offsets"
710       PRINT"  2 to enter different offsets"
720       PRINT"Which choice? ";: A = VAL(INPUT$(1)): PRINT A
730       IF A = 0 THEN GOTO 760 ELSE IF A > 2 THEN PRINT"Erro
r, 0, 1, or 2 only, try again...": GOTO 720
740       IF A = 1 THEN ST.T = ST.T(J): END.T = END.T(J)
750       IF A = 2 THEN INPUT"Start offset (minutes): ", ST.T:
 INPUT"End offset (minutes): ", END.T
760       LSET N13$ = MKI$(ST.T): LSET N14$ = MKI$(END.T)
770       RETURN
780       '
790       OPEN "R", 2, "CUR.DEF", 28
800       FIELD#2, 2 AS N21$, 20 AS N22$, 2 AS N23$, 2 AS N24$
, 2 AS N25$
810       I = 0
820       FOR I = 1 TO 15
830                 GET#2, I
840                 CUR.CAT$(I) = N22$
850       NEXT
860       PRINT MID.SCRN$ "Up to five combinations of currenci
es are allowed for each activity"
870       PRINT"For each currency category enter 1 if it appli
es, 0 if it does not   "
880       CUR(1) = 0: J = 1
890       FOR I = 1 TO 15
900                 PRINT CUR.CAT$(I) "? ";: BIT = VAL(INPUT$(1)
```

```
): PRINT BIT
910             IF BIT THEN CUR(J) = CUR(J) + 2^(I-1)
920     NEXT
930     PRINT"This set complete, enter 0 if done, 1 to enter
 another set";: A = VAL(INPUT$(1)): PRINT A
940     IF A = 1 THEN J = J + 1: IF J > 5 THEN PRINT"No more
 room for currency sets": J = 5 ELSE CUR(J) = 0  GOTO 890
950     IF A <> 0 THEN PRINT"Error, enter 0 or 1 only, try a
gain...": GOTO 930
960     CURR$ = ""
970     FOR I = 1 TO J
980             CURR$ = CURR$ + MKI$(CUR(I))
990     NEXT
1000    LSET N15$ = CURR$
1010    CLOSE#2: RETURN
1020    '
1030    OPEN "R", 2, "QUAL.DEF", 22
1040    FIELD#2, 2 AS N21$, 20 AS N22$
1050    I = 0
1060    FOR I = 1 TO 15
1070            GET#2, I
1080            QUAL.CAT$(I) = N22$
1090    NEXT
1100    PRINT MID.SCRN$ "Up to five combinations of qualific
ations are allowed for each activity"
1110    PRINT"For each qualification category enter 1 if it
applies, 0 if it does not..."
1120    QUAL(1) = 0: J = 1
1130    FOR I = 1 TO 15
1140            PRINT QUAL.CAT$(I) "? ";: BIT = VAL(INPUT$(1
)): PRINT BIT
1150            IF BIT THEN QUAL(J) = QUAL(J) + 2^(I-1)
1160    NEXT
1170    PRINT"This set complete, enter 0 if done, 1 to enter
 another set";: A = VAL(INPUT$(1)): PRINT A
1180    IF A = 1 THEN J = J + 1: IF J > 5 THEN PRINT"No more
 room for qualification sets": J = 5 ELSE QUAL(J) = 0: GOTO
1130
1190    IF A <> 0 THEN PRINT"Error, enter 0 or 1 only, try a
gain...": GOTO 1170
1200    QUAL$ = ""
1210    FOR I = 1 TO J
1220            QUAL$ = QUAL$ + MKI$(QUAL(I))
1230    NEXT
1240    LSET N16$ = QUAL$
1250    CLOSE#2: RETURN
1260    '
```

```
100       '*** UPDATE ***************************************
110       'program dated 21 May 1983
120       '
130       'This program allows entry of availability data for
140       '         pilots
150       '
160       'variables required:
170       '         none
180       '
190       'returns:
200       '         PILnn.DAT files updated and in order
210       '
220       DEFINT A-Z
230       CLR$ = CHR$(26): DOWN$ = CHR$(10): ESC$ = CHR$(27)
240       MID.SCRN$ = CLR$ + STRING$(6,10)
250       HOME$ = CHR$(30): CLR.LINE$ = ESC$ + "T"
260       C$ = "Enter: 0 if correct, 1 to change it: "
270       E$ = "Error, enter 0 or 1 only, try again..."
280       '
290       MAX.PIL.NUM = 60
300       IF P$(0,0) <> CHR$(255) THEN ERASE P$: DIM P$(MAX.PI
L.NUM,4)
310       IF QUAL$(0) <> CHR$(255) THEN ERASE QUAL$: DIM QUAL$
(15)
320       '
330       'open key file...
340       GOSUB 4080
350       'read in all names...
360       GOSUB 4010
370       CLOSE
380       '
390       'open qual.def file...
400       GOSUB 4120
410       FOR I = 1 TO 15: GET#2, I: QUAL$(I) = N22$: NEXT: CL
OSE
420       '
430       'open curevnt.def file...
440       GOSUB 4160
450       FOR I = 1 TO 10: GET#2, I: TRIM$ = N22$: GOSUB 2490:
 EVENT$(I) = TRIM$: NEXT: CLOSE
460       '
470       PRINT MID.SCRN$ "         Enter:"
480       PRINT"              0 to quit, all done"
490       PRINT"              1 to add a new pilot data file"
500       PRINT"              2 to change data in existing data fi
le"
510       PRINT"              3 to delete a pilot data file"
520       PRINT"  Which choice? ";: SEL = VAL(INPUT$(1)): PRIN
T SEL
530       IF SEL <= 0 THEN END ELSE IF SEL > 3 THEN PRINT"Erro
r, enter a number 0 to 3 only, try again...": GOTO 520
540       ON SEL GOSUB 600, 1340, 1560
550       GOTO 470
560       '
570       '___add_pilot_data_____________________________________
```

```
580       '
590       'print names to screen...
600       GOSUB 3890
610       '
620       INPUT"Which pilot number do you want to use? ", NUM
630       IF NUM = 0 GOTO 1280
640       NUM$ = STR$(NUM)
650       NUM$ = MID$(NUM$,2)
660       '
670       'check if file already exists...
680       ON ERROR GOTO 700
690       FILENAME$ = "PIL" + NUM$ + ".DAT": OPEN "I", 1, FILE
NAME$
700       IF ERR = 53 THEN RESUME 750
710       PRINT FILENAME$ " exists on this disk, confirm you w
ant to overwrite (destroy) it"
720       PRINT: PRINT"Enter 0 to continue, 1 to NOT overwrite
 this file: ";: A$ = INPUT$(1): PRINT A$
730       IF A$ = "1" GOTO 420
740       IF A$ <> "0" THEN PRINT E$: GOTO 720
750       ON ERROR GOTO 0
760       CLOSE
770       '
780       'name data entered at subroutines...
790       FOR I = 1 TO 3: ON I GOSUB 4270, 4360, 4400: NEXT
800       '
810       'check admin data, update key file...
820       GOSUB 2580
830       '
840       'now put in individual file...
850       OPEN "O", 1, FILENAME$
860       WRITE#1, NUM$
870       WRITE#1, L.NAME$, F.NAME$, MI$
880       WRITE#1, RANK$
890       WRITE#1, SSAN$
900       '
910       'ask and save qualifications at once...
920       WRITE#1, "QUALIFICATIONS."
930       FOR I = 1 TO 15
940       PRINT MID.SCRN$
950       PRINT"Enter a 1 digit if the qualification applies,
0 if it does not"
960       PRINT: PRINT QUAL$(I) "? 0 or 1: ";: A = VAL(INPUT$(
1)): IF A < 0 OR A > 1 THEN PRINT A E$: GOTO 960
970       WRITE#1, A
980       NEXT
990       CLOSE #2
1000      '
1010      'same for currency dates...
1020      WRITE#1, "CURRENCIES."
1030      'open curr event name file as #2...
1040      GOSUB 4160
1050      FOR I = 1 TO 10
1060      PRINT MID.SCRN$
1070      PRINT"Enter the date " EVENT$(I) " last accomplished
```

```
 or 0 for none: "
1080     GOSUB 5630
1090     WRITE#1, DATE
1100     NEXT
1110     CLOSE #2
1120     '
1130     'open activity definiton file.
1140     GOSUB 4200
1150     A = 1: N = 0: MAX.N = 10
1160     GOSUB 1920
1170     'save max number activites...
1180     MAX.N = N
1190     '
1200     'entries complete, sort them...
1210     GOSUB 4890
1220     'then check for conflicts...
1230     GOSUB 5070
1240     'print to file...
1250     WRITE#1, "ACTIVITIES SCHEDULED:", MAX.N
1260     FOR I = 1 TO MAX.N: PRINT#1, ACT$(I): NEXT
1270     CLOSE
1280 RETURN
1290     '
1300     '
1310     '___change_or_add_to_existing_pilot_data_files_____
1320     '
1330     'get and check pilot number...
1340     GOSUB 1730
1350     '
1360     'read file into memory...
1370     GOSUB 3550
1380     PRINT MID.SCRN$ CVI(P$(NUM,1)) " - " P$(NUM,2) P$(NU
M,3) " " P$(NUM,4)
1390     PRINT: PRINT"    Enter:"
1400     PRINT"           0 if no more changes or additions, a
ll done"
1410     PRINT"           1 to change admin data (name, rank,
SSAN)"
1420     PRINT"           2 to change qualification data"
1430     PRINT"           3 to update currency data"
1440     PRINT"           4 to add, change or delete availabil
ity data"
1450     PRINT"  Which choice? ";: A = VAL(INPUT$(1)): PRINT
A
1460     '
1470     IF A = 0 THEN GOSUB 2900: RETURN
1480     IF A > 4 THEN PRINT"Error, enter 0 to 4 only, try ag
ain...": GOTO 1450
1490     ON A GOSUB 2580, 3130, 3230, 3330
1500     GOTO 1380
1510     '
1520     '
1530     '___delete_complete_pilot_data_file_________________
1540     '
1550     'get and check pilot number...
```

```
1560     GOSUB 1730
1570     PRINT"Enter 0 to delete this file, 1 to abort delete
 action"
1580     INPUT"Which one"; D
1590     IF D <> 0 THEN PRINT"Exiting delete mode, file NOT d
eleted...": FOR I = 1 TO 1000: NEXT: GOTO 1680
1600     OPEN "O", 3, TMP.FIL$: CLOSE#3: GOSUB 3030: KILL FIL
ENAME$
1610     'reset key file...
1620     GOSUB 4080
1630     LSET N1$ = MKI$(NUM): LSET N2$ = "Not in use": LSET
N3$ = "  ": LSET N4$ = "    "
1640     PUT#1, NUM
1650     CLOSE#1
1660     'reset memory variables...
1670     P$(NUM,2) = "Not in use": P$(NUM,3) = "  ": P$(NUM,4
) = "    "
1680     RETURN
1690     '
1700     '___subroutines_____________________________________
1710     '
1720     'get and confirm pilot number...
1730     PRINT MID.SCRN$
1740     PRINT"Enter the last name or pilot number:";: INPUT"
 ", ANSWER$
1750     IF ASC(LEFT$(ANSWER$,1)) < 58 THEN NUM = VAL(ANSWER$
): THIS.NUM = -1 ELSE NUM = 0: L.NAME$ = ANSWER$
1760     'look for name match...
1770     WHILE NUM < MAX.PIL.NUM AND NOT THIS.NUM
1780              NUM = NUM + 1
1790              IF L.NAME$ = LEFT$(P$(NUM,2),LEN(L.NAME$)) T
HEN THIS.NUM = -1 ELSE THIS.NUM = 0
1800     WEND
1810     IF THIS.NUM = 0 THEN GOSUB 3890: PRINT: PRINT"Enter
pilot number: ";: INPUT NUM
1820     IF NUM = 0 THEN GOTO 1890
1830     PRINT MID.SCRN$ CVI(P$(NUM,1)) " - " P$(NUM,2) P$(NU
M,3) " " P$(NUM,4)
1840     PRINT"Enter 0 if this the correct entry; 1 if not co
rrect:";: THIS.NUM = VAL(INPUT$(1)): PRINT THIS.NUM
1850     IF THIS.NUM = 1 THEN THIS.NUM = 0: GOTO 1810
1860     IF THIS.NUM <> 0 THEN PRINT"Error, enter 0 or 1 only
...": GOTO 1830
1870     'have correct number, get filenames...
1880     GOSUB 3810
1890     RETURN
1900     '
1910     'input a new activity...
1920     WHILE A
1930              N = N + 1
1940              PRINT"Enter activity code (? for help) ";
1950              INPUT" ", CODE$
1960              IF CODE$ = "?" THEN GOSUB 4450 ELSE IF CODE$
 = "0" THEN GOTO 2400
1970              ACT.CODE = VAL(CODE$)
```

```
1980              IF ACT.CODE < 1 OR ACT.CODE > 255 THEN PRINT
"Entry is out of range...": GOSUB 4450: GOTO 1970
1990              IF (ACT.CODE AND 63) = 63 THEN OTHER = -1 EL
SE OTHER = 0
2000              IF OTHER THEN INPUT"What is the activity nam
e? ", ACT.NAME$: GOTO 2060
2010              GET#2, ACT.CODE
2020              TRIM$ = N22$
2030              GOSUB 2490
2040              ACT.NAME$ = TRIM$
2050     '
2060              PRINT MID.SCRN$
2070              PRINT"Enter the date " ACT.NAME$ " starts or
 occurs on:"
2080              GOSUB 5630
2090              ACT.DATE = DATE: END.DATE = 0
2100              PRINT MID.SCRN$
2110              PRINT"Enter the scheduled time: ";
2120              INPUT TIME$: GOSUB 5190
2130              IF OTHER THEN GOSUB 4690: GOTO 2230 ELSE IF
ACT.CODE = 62 OR ACT.CODE = 61 THEN GOSUB 4820: GOTO 2230
2140     'not other and not 61 or 62...
2150              PRINT MID.SCRN$
2160              PRINT"  Enter:"
2170              PRINT"           0 if standard time offsets a
pply"
2180              PRINT"           1 to change them"
2190              PRINT"  Which choice? ";: A$ = INPUT$(1): PR
INT A$
2200              IF A$ = "1" THEN GOSUB 4690: GOTO 2230
2210              IF A$ <> "0" THEN PRINT E$: GOTO 2160
2220              START = CVI(N23$): END.T = CVI(N24$)
2230              ACT.ST.TIME = TIME - START: ACT.END.TIME = T
IME + END.T
2240              IF END.DATE = 0 THEN END.DATE = ACT.DATE
2250              ACT.LN$ = STRING$(25,32)
2260              MID$(ACT.LN$,1,5) = STR$(ACT.CODE)
2270              MID$(ACT.LN$,6,5) = STR$(ACT.DATE)
2280              MID$(ACT.LN$,11,5) = STR$(ACT.ST.TIME)
2290              MID$(ACT.LN$,16,5) = STR$(END.DATE)
2300              MID$(ACT.LN$,21,5) = STR$(ACT.END.TIME)
2310              ACT.LN$ = ACT.LN$ + ACT.NAME$
2320              IF N >= MAX.N THEN GOSUB 3740
2330              ACT$(N) = ACT.LN$
2340              PRINT MID.SCRN$ "        Check the activity d
ata "
2350              PRINT N "        " ACT$(N)
2360              PRINT C$,. A = VAL(INPUT$(1)): PRINT A
2370              IF A = 1 THEN GOTO 1940
2380              IF A <> 0 THEN PRINT E$: GOTO 2360
2390     '
2400              PRINT"Enter:"
2410              PRINT"  0 if entries complete"
2420              PRINT"  1 if more activities to enter"
2430              PRINT"Which one? ";: A = VAL(INPUT$(1)): PRI
```

```
NT A
2440              IF A < 0 OR A > 1 THEN PRINT E$;  GOTO 2430
2450     WEND:  'activity entry loop.
2460 RETURN
2470     '
2480     '
2490     L = LEN(TRIM$) + 1:  L.CHR$ = CHR$(0)
2500     WHILE ASC(L.CHR$) < 33
2510              L = L - 1
2520              L.CHR$ = MID$(TRIM$,L,1)
2530     WEND
2540     TRIM$ = LEFT$(TRIM$,L)
2550 RETURN
2560     '
2570     'change admin data...
2580     PRINT MID.SCRN$
2590     PRINT"Check the pilot data:"
2600     PRINT:  PRINT"Pilot number assigned:  "; NUM$
2610     PRINT:  PRINT L.NAME$ ", " F.NAME$ " " MI$ ", " RANK$
 "  " SSAN$
2620     PRINT:  PRINT
2630     PRINT"   Change which entry:"
2640     PRINT"              0 - no more changes, all correct"
2650     PRINT"              1 - name"
2660     PRINT"              2 - rank/grade"
2670     PRINT"              3 - SSAN"
2680     PRINT"              4 - change all entries"
2690     PRINT"   Which one? ";: A1$ = INPUT$(1):  PRINT A1$
2700     IF A1$ = "0" THEN GOTO 2760
2710     IF VAL(A1$) > 4 THEN PRINT"Error, enter 0 to 4 only,
 try again...":  GOTO 2690
2720     ON VAL(A1$) GOSUB 4270, 4360, 4400, 4250
2730     '
2740     'entries are correct, put in key file...
2750     'open key file...
2760     GOSUB 4080
2770     'and save key data...
2780     LSET N1$ = MKI$(NUM)
2790     LSET N2$ = L.NAME$
2800     INIT$ = LEFT$(F.NAME$,1) + LEFT$(MI$,1)
2810     LSET N3$ = INIT$
2820     LSET N4$ = RANK$
2830     PUT#1, NUM
2840     CLOSE#1
2850     'put in memory array...
2860     P$(NUM,1) = MKI$(NUM):  P$(NUM,2) = L.NAME$ + STRING$
(20-LEN(L.NAME$),32):  P$(NUM,3) = INIT$:  P$(NUM,4) = RANK$
2870 RETURN
2880     '
2890     'put all data in individual file (called from many r
outines)...
2900     OPEN "O", 1, TMP.FIL$
2910     WRITE#1, NUM$
2920     WRITE#1, L.NAME$, F.NAME$, MI$
2930     WRITE#1, RANK$
```

```
2940     WRITE#1, SSAN$
2950     WRITE#1, QUAL.ID$
2960     FOR I = 1 TO 15: WRITE#1, QV(I): NEXT
2970     WRITE#1, CUR.ID$
2980     FOR I = 1 TO 10: WRITE#1, CUR.DT(I): NEXT
2990     WRITE#1, ACT.ID$, MAX.N
3000     FOR I = 1 TO MAX.N: PRINT#1, ACT$(I): NEXT
3010     CLOSE
3020     'and rename files...
3030     ON ERROR GOTO 3090
3040     KILL BAK.FIL$
3050     ON ERROR GOTO 0
3060     NAME FILENAME$ AS BAK.FIL$
3070     NAME TMP.FIL$ AS FILENAME$
3080     GOTO 3100
3090     IF ERR = 53 THEN RESUME 3050 ELSE GOTO 3050
3100 RETURN
3110     '
3120     'change qual data...
3130     PRINT MID.SCRN$ CVI(P$(NUM,1)) " - " P$(NUM,2) P$(NU
M,3) " " P$(NUM,4)
3140     FOR I = 1 TO 15: PRINT I TAB(6) QUAL$(I) QV(I): NEXT
3150     '
3160     PRINT: PRINT"Enter 0 if all correct or qual number t
o change"
3170     PRINT"Which number (0-15)?";: INPUT QN
3180     IF QN = 0 THEN RETURN ELSE IF QN > 15 THEN PRINT"Err
or, a number from 0 to 15 only, try again...": GOTO 3170
3190     IF QV(QN) = 1 THEN QV(QN) = 0 ELSE QV(QN) = 1
3200     GOTO 3140
3210     '
3220     'update currency dates...
3230     PRINT MID.SCRN$ CVI(P$(NUM,1)) " - " P$(NUM,2) P$(NU
M,3) " " P$(NUM,4)
3240     FOR I = 1 TO 10: PRINT I TAB(6) EVENT$(I) TAB(28) CU
R.DT(I): NEXT
3250     PRINT: PRINT"Enter 0 if correct or item number to ch
ange"
3260     PRINT"Which number (0-10)";: INPUT CN
3270     IF CN <= 0 THEN RETURN ELSE IF CN > 10 THEN PRINT"Er
ror, enter a number from 0 to 10 only, try again...": GOTO 3
260
3280     PRINT"Enter the new currency date (accomplished date
)": GOSUB 5630
3290     CUR.DT(CN) = DATE: GOTO 3230
3300     'returns on zero entry above...
3310     '
3320     'add, change or delete availability data...
3330     PRINT MID.SCRN$ CVI(P$(NUM,1)) " - " P$(NUM,2) P$(NU
M,3) " " P$(NUM,4)
3340     PRINT"  Enter:"
3350     PRINT"          0 if activity changes completed"
3360     PRINT"          1 to add new activities"
3370     PRINT"          2 to change existing activities"
3380     PRINT"          3 to delete activities"
```

```
3390     PRINT"  Which choice? ";: A = VAL(INPUT$(1)): PRINT
A
3400     IF A = 0 THEN RETURN ELSE IF A > 3 THEN PRINT"Error,
 enter a number from 0 to 3 only, try again...": GOTO 3390
3410     ON A GOSUB 3460, 3510, 3520
3420     GOTO 3330
3430     'return selected with zero response above...
3440     '
3450     'open def file, get activity entries...
3460     GOSUB 4200: PRINT MID.SCRN$;: N = MAX.N: A = 1: GOSU
B 1920: CLOSE#2: MAX.N = N
3470     'sort and check for conflicts...
3480     GOSUB 4890: GOSUB 5070
3490 RETURN
3500     '
3510     PRINT"Change not written yet...": DUMMY$ = INPUT$(1)
: RETURN
3520     PRINT"Delete not written yet...": DUMMY$ = INPUT$(1)
: RETURN
3530     '
3540     'open data file and read into memory, close...
3550     OPEN "I", 2, FILENAME$
3560     INPUT #2, NUM$, L.NAME$, F.NAME$, MI$, RANK$, SSAN$
3570     IF EOF(2) THEN GOTO 3700 ELSE INPUT#2, QUAL.ID$
3580     IF QUAL.ID$ <> "QUALIFICATIONS:" THEN PRINT"Qual dat
a not found":
3590     IF QV(0) <> -1 THEN ERASE QV: DIM QV(15)
3600     FOR I = 1 TO 15: IF EOF(2) THEN GOTO 3700 ELSE INPUT
#2, QV(I): NEXT
3610     IF EOF(2) THEN GOTO 3700 ELSE INPUT#2, CUR.ID$
3620     IF CUR.ID$ <> "CURRENCIES:" THEN PRINT"Cur data not
found":
3630     FOR I = 1 TO 10: IF EOF(2) THEN GOTO 3700 ELSE INPUT
#2, CUR.DT(I): NEXT
3640     IF EOF(2) THEN GOTO 3700 ELSE INPUT#2, ACT.ID$, MAX.
N
3650     IF ACT.ID$ <> "ACTIVITIES SCHEDULED:" THEN PRINT"Act
ivity data not found":
3660     FOR N = 1 TO MAX.N
3670              IF EOF(2) THEN PRINT"EOF before MAX.N..." MA
X.N N;: DUMMY$ = INPUT$(1): GOTO 3700
3680              LINE INPUT#2, ACT$(N)
3690     NEXT
3700     CLOSE#2
3710 RETURN
3720     '
3730     'dynamic array size increase...
3740     IF TMP$(0) <> CHR$(255) THEN ERASE TMP$: DIM TMP$(MA
X.N)
3750     FOR M = 1 TO MAX.N: TMP$(M) = ACT$(M): NEXT
3760     ERASE ACT$: DIM ACT$(MAX.N + 10)
3770     FOR M = 1 TO MAX.N: ACT$(M) = TMP$(M): NEXT
3780     MAX.N = MAX.N + 10
3790     RETURN
3800     'make pilnn.dat filenames...
```

```
3810      NUM$ = STR$(NUM)
3820      NUM$ = MID$(NUM$,2)
3830      FILENAME$ = "PIL" + NUM$ + ".DAT"
3840      TMP.FIL$ = "PIL" + NUM$ + ".$$$"
3850      BAK.FIL$ = "PIL" + NUM$ + ".BAK"
3860  RETURN
3870      '
3880      'print all pilot names to screen...
3890      PRINT CLR$
3900      FOR I = 1 TO 20
3910      NUM = CVI(P$(I,1)): L.NAME$ = P$(I,2): INIT$ = P$(I,
3): RANK$ = P$(I,4)
3920      PRINT USING "###"; NUM;: PRINT " - " LEFT$(L.NAME$,1
1) INIT$ " " RANK$;
3930      NUM = CVI(P$(I+20,1)): L.NAME$ = P$(I+20,2): INIT$ =
 P$(I+20,3): RANK$ = P$(I+20,4)
3940      PRINT TAB(27) USING "###"; NUM;: PRINT " - " LEFT$(L
.NAME$,11) INIT$ " " RANK$;
3950      NUM = CVI(P$(I+40,1)): L.NAME$ = P$(I+40,2): INIT$ =
 P$(I+40,3): RANK$ = P$(I+40,4)
3960      PRINT TAB(55) USING "###"; NUM;: PRINT " - " LEFT$(L
.NAME$,11) INIT$ " " RANK$
3970      NEXT
3980      RETURN
3990      '
4000      'get pilot names from key file...
4010      FOR I = 1 TO MAX.PIL.NUM
4020              GET#1, I
4030              P$(I,1) = N1$: P$(I,2) = N2$: P$(I,3) = N3$:
 P$(I,4) = N4$
4040      NEXT
4050      RETURN
4060      '
4070      'open and field def files...
4080      OPEN "R", 1, "FILNAM.DEF", 27
4090      FIELD#1, 2 AS N1$, 20 AS N2$, 2 AS N3$, 3 AS N4$
4100      RETURN
4110      '
4120      OPEN "R", 2, "QUAL.DEF", 22
4130      FIELD#2, 2 AS N21$, 20 AS N22$
4140      RETURN
4150      '
4160      OPEN "R", #2, "CUREVNT.DEF", 26
4170      FIELD#2, 2 AS N21$, 20 AS N22$, 2 AS N23$, 2 AS N24$
4180      RETURN
4190      '
4200      OPEN "R", 2, "ACT.DEF", 46
4210      FIELD#2, 2 AS N21$, 20 AS N22$, 2 AS N23$, 2 AS N24$
, 10 AS N25$, 10 AS N26$
4220      RETURN
4230      '
4240      'correct all name area variables
4250      FOR I = 1 TO 3: ON I GOSUB 4270, 4360, 4400: NEXT: R
ETURN
4260      '
```

```
4270     PRINT MID.SCRN$
4280     INPUT"What is the pilot's last name? ", L.NAME$
4290     PRINT MID.SCRN$
4300     INPUT"What is his first name? ", F.NAME$
4310     PRINT MID.SCRN$
4320     LINE INPUT"Enter his middle initial(s), `Jr.', etc,
or 0 (zero) for none: ", MI$
4330     IF MI$ = "0" THEN MI$ = ""
4340     RETURN
4350     '
4360     PRINT MID.SCRN$
4370     INPUT"What is his rank/grade? ", RANK$
4380     RETURN
4390     '
4400     PRINT MID.SCRN$
4410     INPUT"What is his service number (SSAN)? ", SSAN$
4420     RETURN
4430     '
4440     'read in activity codes and names, assumes def file
open as #2...
4450     PRINT"Select the desired activity category"
4460     PRINT"   1 for non-duty (leave, TDY, etc)"
4470     PRINT"   2 for non-flying duty activities"
4480     PRINT"   3 for flying activities"
4490     PRINT"Which category? ";: A = VAL(INPUT$(1)): PRINT
A
4500     GP = (A - 1)*64
4510     FOR I = 1 TO 21
4520       GET#2, I + GP
4530       ACT.CODE = CVI(N21$)
4540       ACT.NAME$ = N22$
4550       PRINT USING "###"; ACT.CODE;: PRINT " - " ACT.NAME
$;
4560       GET#2, I + GP + 21
4570       ACT.CODE = CVI(N21$)
4580       ACT.NAME$ = N22$
4590       PRINT TAB(27) USING "###"; ACT.CODE;: PRINT " - "
ACT.NAME$;
4600       GET#2, I + GP + 42
4610       ACT.CODE = CVI(N21$)
4620       ACT.NAME$ = N22$
4630       PRINT TAB(55) USING "###"; ACT.CODE;: PRINT " - "
ACT.NAME$
4640     NEXT
4650     PRINT: PRINT"Which activity code?";: INPUT" ", CODE$
4660     RETURN
4670     '
4680     'other, input start and end time offsets...
4690     PRINT MID.SCRN$
4700     PRINT"Enter the amount of time (hrs:min) needed prio
r to the scheduled"
4710     PRINT"activity time (e.g. travel time to a meeting o
r briefing time)"
4720     PRINT: PRINT"How much time? ";: GOSUB 5450
4730     START = DUR
```

```
4740     PRINT MID.SCRN$
4750     PRINT"Enter the amount of time for the activity, inc
lude debriefing, "
4760     PRINT"return travel, etc as applicable"
4770     PRINT: PRINT"How much time? ";: GOSUB 5450
4780     END.T = DUR
4790     RETURN
4800     '
4810     'long duration activities--leave, tdy, etc...
4820     PRINT MID.SCRN$
4830     PRINT"What is the ending date of " ACT.NAME$
4840     GOSUB 5630
4850     END.DATE = DATE
4860     RETURN
4870     '
4880     'sort activities...
4890     SWAP. = -1: LAST = MAX.N - 1
4900     WHILE SWAP.
4910          SWAP. = 0
4920          FOR I = 1 TO LAST
4930               SD1 = VAL(MID$(ACT$(I),6,5)): ST1 = VAL(MID$
(ACT$(I),11,5))
4940               SD2 = VAL(MID$(ACT$(I+1),6,5)): ST2 = VAL(MI
D$(ACT$(I+1),11,5))
4950               IF (SD1 > SD2) OR (SD1 = SD2 AND ST1 > ST2)
THEN GOSUB 5000
4960          NEXT
4970          LAST = LAST - 1
4980     WEND
4990 RETURN
5000     TMP$ = ACT$(I+1)
5010     ACT$(I+1) = ACT$(I)
5020     ACT$(I) = TMP$
5030     SWAP. = -1
5040 RETURN
5050     '
5060     'conflict check, done after activities sorted by sta
rt...
5070     LAST = MAX.N - 1
5080     FOR I = 1 TO LAST
5090               ED1 = VAL(MID$(ACT$(I),16,5)): ET1 = VAL(MID
$(ACT$(I),21,5))
5100               SD2 = VAL(MID$(ACT$(I+1),6,5)): ST2 = VAL(MI
D$(ACT$(I+1),11,5))
5110     '
5120     'conflict is TRUE if first activity ends after secon
d starts...
5130               IF (ED1 < SD2) OR (ED1 = SD2 AND ET1 < ST2)
THEN CONFLICT = 0 ELSE CONFLICT = -1
5140               IF CONFLICT THEN PRINT"Conflict found with:"
: PRINT ACT$(I): PRINT ACT$(I+1)
5150     NEXT
5160 RETURN
5170     '
5180     'time of day validating routine ..
```

```
5190     NT = 0
5200     T$ = ""
5210     WHILE T$ <> ":" AND NT < LEN(TIME$)
5220              NT = NT + 1
5230              T$ = MID$(TIME$,NT,1)
5240     WEND
5250     IF NT = 0 GOTO 5390
5260     IF NT = LEN(TIME$) THEN NT = LEN(TIME$) - 1: MIN = V
AL(RIGHT$(TIME$,2)) ELSE MIN = VAL(RIGHT$(TIME$,LEN(TIME$) -
 NT))
5270     HR=VAL(LEFT$(TIME$,NT-1))
5280     BAD = 0
5290     IF MIN < 0 OR MIN > 59 THEN BAD = -1
5300     IF HR < 0 OR HR > 24 THEN BAD = -1
5310     TIME = HR*60 + MIN
5320     T$ = CHR$(INT(HR/10)+48)
5330     I$ = CHR$((HR MOD 10)+48)
5340     M$ = CHR$(INT(MIN/10)+48)
5350     E$ = CHR$((MIN MOD 10)+48)
5360     TIME$ = T$ + I$ + M$ + E$
5370     IF BAD THEN PRINT"Time " TIME$ " not understood, ple
ase re-enter:";: INPUT" ", TIME$: GOTO 5190
5380     NT = 0: T$ = "": I$ = "": M$ = "": E$ = "": BAD = 0:
 HR = 0: MIN = 0
5390 RETURN
5400     '  ------------------------------------------------
5410 '
5420 '   --- This routine accepts an input of numbers until a
 colon is keyed,
5430 '            then allows only two digits up to a value of
 60...
5440 '
5450     CK$ = ""
5460     DIGIT$ = INPUT$(1)
5470     IF ASC(DIGIT$)<48 OR ASC(DIGIT$)>58 THEN PRINT "Nume
rical digits or colon (:) only, please re-enter: ";: GOTO 54
60
5480     CK$ = CK$ + DIGIT$
5490     IF RIGHT$(CK$,1) <> ":" THEN 5460
5500     HR = VAL(LEFT$(CK$,LEN(CK$)-1))
5510     MIN$ = INPUT$(2)
5520     IF VAL(MIN$) > 60 THEN PRINT "Max number of minutes
is 60, please re-enter: ": GOTO 5510
5530     MIN = VAL(MIN$)
5540     CK$ = CK$ + MIN$
5550     PRINT: PRINT "The interval entered is: " CK$ ", is t
his correct?"
5560     PRINT C$;: A$ = INPUT$(1): PRINT A$
5570     IF A$ = "1" THEN PRINT"Re-enter interval from beginn
ing: ": GOTO 5450
5580     IF A$ <> "0" THEN PRINT E$: GOTO 5560
5590     DUR = HR*60 + MIN
5600 RETURN
5610 '  ------------------------------------------------
5620     '
```

```
5630    IF MONTH$(0) <> CHR$(255) THEN ERASE MONTH$
5640    DIM MONTH$(12)
5650    MONTH$(1) = "JAN"
5660    MONTH$(2) = "FEB"
5670    MONTH$(3) = "MAR"
5680    MONTH$(4) = "APR"
5690    MONTH$(5) = "MAY"
5700    MONTH$(6) = "JUN"
5710    MONTH$(7) = "JUL"
5720    MONTH$(8) = "AUG"
5730    MONTH$(9) = "SEP"
5740    MONTH$(10) = "OCT"
5750    MONTH$(11) = "NOV"
5760    MONTH$(12) = "DEC"
5770    '
5780    IF FIRST.DAY(0) = 0 THEN ERASE FIRST.DAY
5790    DIM FIRST.DAY(12)
5800    '
5810    'reset FIRST.DAY(3..12) if correcting a date...
5820    '
5830    FIRST.DAY(1) = 1
5840    FIRST.DAY(2) = 32
5850    FIRST.DAY(3) = 60
5860    FIRST.DAY(4) = 91
5870    FIRST.DAY(5) = 121
5880    FIRST.DAY(6) = 152
5890    FIRST.DAY(7) = 182
5900    FIRST.DAY(8) = 213
5910    FIRST.DAY(9) = 244
5920    FIRST.DAY(10) = 274
5930    FIRST.DAY(11) = 305
5940    FIRST.DAY(12) = 335
5950    '
5960    '--- get the date ---
5970    '
5980    INPUT"What is the date (Day Month Year)", DATE$
5990    IF DATE$ = "0" THEN DATE = 0: RETURN
6000    '
6010    'put the date chars in individual variables...
6020    '
6030    IF D$(0) <> CHR$(255) THEN ERASE D$
6040    DIM D$(LEN(DATE$))
6050    FIRST.DLMTR = 0
6060    '
6070    FOR I.V = 1 TO LEN(DATE$)
6080            D$(I.V) = MID$(DATE$,I.V,1)
6090            IF FIRST.DLMTR <> 0 THEN 6180
6100    'if first delimiter not set, look for it; allow almo
st
6110    '    any char except letters or numbers to delimit...
6120            D = ASC(D$(I.V))
6130            IF D < 48 THEN DLMT = -1
6140            IF (D > 57 AND D < 65) THEN DLMT = -1
6150            IF (D > 90 AND D < 96) THEN DLMT = -1
6160            IF DLMT THEN FIRST.DLMTR = I.V
```

```
6170              DLMT = 0
6180      NEXT
6190      '
6200      'assume the last two chars are the year...
6210      '
6220      YEAR = VAL(RIGHT$(DATE$,2))
6230      '
6240      'find the day...
6250      'if a delimiter was found then day is the value
6260      'before the delimiter, otherwise the day is either
6270      'the first character or the first two characters of
6280      'the string--assume the first two characters if the
6290      'second character is not a letter
6300      '
6310      IF FIRST.DLMTR THEN DAY = VAL(LEFT$(DATE$,FIRST.DLMT
R - 1)) ELSE IF ASC(D$(2)) < 58 THEN DAY = VAL(LEFT$(DATE$,2
)): FIRST.DL
MTR = 2 ELSE DAY = VAL(LEFT$(DATE$,1)): FIRST.DLMTR = 1
6320      '
6330      'find the month...
6340      'just look at three characters past the day or past
6350      '     the first delimiter
6360      '        - month could be a number or letters
6370      '        - convert lower case letters to upper
6380      '
6390      MONTH$=""
6400      MON.NUM = 0
6410      FOR I.V = 1 TO 3
6420              IF ASC(D$(FIRST.DLMTR+I.V)) < 58 THEN MON.NU
M = -1
6430              IF ASC(D$(FIRST.DLMTR+I.V)) > 96 THEN D$(FIR
ST.DLMTR+I.V) = CHR$(ASC(D$(FIRST.DLMTR+I.V))-32)
6440              MONTH$ = MONTH$ + D$(FIRST.DLMTR+I.V)
6450      NEXT
6460      '
6470      'MONTH$ is now a string of numbers or letters,
6480      '     MON.NUM is TRUE if it is numbers
6490      '
6500      IF MON.NUM THEN MONTH=VAL(LEFT$(MONTH$,2)): GOTO 658
0
6510      FOR I.V = 1 TO 12
6520              FOR J.V = 1 TO 3
6530                      IF MID$(MONTH$,J.V,1) = MID$(MONTH$(
I.V),J.V,1) THEN TEST = -1 ELSE TEST = 0
6540                      IF NOT TEST GOTO 6570  ' one not mat
ching is enough
6550              NEXT J.V
6560              IF TEST THEN MONTH = I.V  GOTO 6580: ' found
 a match
6570      NEXT I.V
6580      IF MONTH < 1 OR MONTH > 12 THEN INPUT"Month not unde
rstood--enter the month as a one or two digit number (1..12)
", MONTH: GO
TO 6580
6590      '
```

```
6600     'MONTH is now valid, set MONTH$ if reqd...
6610     '
6620     IF MON.NUM THEN MONTH$ = MONTH$(MONTH)
6630     '
6640     'check if this is a leap year...
6650     '
6660     IF YEAR/4 = INT(YEAR/4) THEN LEAP.YEAR = -1 ELSE LEA
P.YEAR = 0
6670     '
6680     'if so must increment first day values after
6690     '        February...
6700     '
6710     IF LEAP.YEAR THEN FOR I.V = 3 TO 12: FIRST.DAY(I.V)
= FIRST.DAY(I.V) + 1: NEXT
6720     '
6730     'make sure the number of days is valid for the
6740     '     month
6750     '        compute max days in month...
6760     IF MONTH = 12 THEN MAX.DAY$ = " 31" ELSE MAX.DAY$ =
STR$(FIRST.DAY(MONTH + 1) - FIRST.DAY(MONTH))
6770     MAX.DAY$ = MID$(MAX.DAY$,2,2)
6780     '        then check range
6790     IF DAY < 1 OR DAY > VAL(MAX.DAY$) THEN PRINT "Day of
 month not understood--input day as a number <1.." MAX.DAY$
")";: INPUT"
", DAY
6800     '
6810     'now put it together and see if correct...
6820     '
6830     DAY$ = STR$(DAY): YR$ = STR$(YEAR): DATE$ = DAY$ + "
" + MONTH$ + YR$
6840     PRINT"The date entered is: "; DATE$
6850     PRINT: PRINT C$;
6860     A$ = INPUT$(1)
6870     IF A$ = "1" THEN GOTO 5830: 'try again...
6880     IF A$ <> "0" THEN PRINT E$: GOTO 6840
6890     '.
6900     'date is valid and checked correct, make the julian
6910     '     date...
6920     '        julian date form is year digit * 1000 + juli
an date
6930     '
6940     DATE = VAL(RIGHT$(STR$(YEAR),1))*1000 + FIRST.DAY(MO
NTH) + DAY -1
6950     '
6960     'reset all variables not needed
6970     '
6980     ERASE D$
6990     YEAR = 0: MONTH = 0: DAY = 0: MON.NUM = 0
7000     FIRST.DLMTR = 0: A$ = "": MAX.DAY$ = ""
7010     DAY$ = "": MONTH$ = "": YR$ = ""
7020 RETURN
7030     '
```

```
100       '*** SHELL.SET ************************************
110       'program dated 17 May 1983
120       '
130       'This program allows entry of the schedule shell
140       '         data for a given week
150       '
160       'variables required:
170       '         none
180       '
190       'returns:
200       '         SHELLnn.DAT files updated and in order
210       '
220       DEFINT A-Z
230       CLR$ = CHR$(26): DOWN$ = CHR$(10): ESC$ = CHR$(27)
240       MID.SCRN$ = CLR$ + STRING$(6,10)
250       UP$ = CHR$(11): MOV.LEFT$ = CHR$(8): MOV.RIGHT$ = CH
R$(12)
260       HOME$ = CHR$(30): CLR.LINE$ = ESC$ + "T"
270       C$ = "Enter: 0 if correct, 1 to change it: "
280       E$ = "Error, enter 0 or 1 only, try again..."
290       '
300       MAX.PIL.NUM = 60
310       DIM P$(MAX.PIL.NUM,4)
320       '
330       'get pilot names...
340       GOSUB 3250
350       GOSUB 3180
360       CLOSE
370       '
380       PRINT MID.SCRN$ "         Enter:"
390       PRINT"            0 to quit, all done"
400       PRINT"            1 to add a new shell data file"
410       PRINT"            2 to change data in existing data fi
le"
420       PRINT"            3 to delete a shell data file"
430       PRINT"  Which choice? ";: SEL = VAL(INPUT$(1)): PRIN
T SEL
440       IF SEL <= 0 THEN END ELSE IF SEL > 3 THEN PRINT"Erro
r, enter a number 0 to 3 only, try again...": GOTO 430
450       PRINT MID.SCRN$ "Enter the week starting date (Sunda
y):"
460       GOSUB 4370
470       WK.DATE = DATE: WK.DATE$ = DATE$
480       WK.NUM = (WK.DATE MOD 1000)\7: WK.NUM$ = MID$(STR$(W
K.NUM),2)
490       FILENAME$ = "SHELL" + WK.NUM$ + ".DAT"
500       '
510       ON SEL GOSUB 570, 1090, 1840
520       GOTO 380
530       '
540       '___new_shell_data_____________________________________
550       '
560       'check if file already exists...
570       ON ERROR GOTO 590
580       OPEN "I", 1, FILENAME$
```

```
590     IF ERR = 53 THEN RESUME 640
600     PRINT FILENAME$ " exists on this disk, confirm you w
ant to overwrite (destroy) it"
610     PRINT: PRINT"Enter 0 to continue, 1 to NOT overwrite
 this file: ";: A$ = INPUT$(1): PRINT A$
620     IF A$ = "1" GOTO 380
630     IF A$ <> "0" THEN PRINT E$: GOTO 610
640     ON ERROR GOTO 0
650     CLOSE
660     '
670     'open shell data file as #1...
680     GOSUB 2900
690     '
700     'open activity definiton file as #2...
710     GOSUB 3290
720     '
730     A = 1: N = 0: MAX.N = 10
740     WHILE A
750             N = N + 1
760             PRINT MID.SCRN$;
770             GOSUB 2280
780             '
790             PRINT"Enter:"
800             PRINT"  0 if entries complete"
810             PRINT"  1 if more activities to enter"
820             PRINT"Which one? ";: A = VAL(INPUT$(1)): PRI
NT A
830             IF A < 0 OR A > 1 THEN PRINT E$;: GOTO 820
840     'if greater than dimension of variable, then expand
it...
850             IF N >= MAX.N THEN GOSUB 2970
860             ACT$(N) = ACT.LN$
870     WEND: 'activity entry loop...
880     'save max number activites...
890     MAX.N = N
900     '
910     'entries complete, sort them...
920     GOSUB 3710
930     'print to file...
940     '
950     FOR I = 1 TO MAX.N
960             LSET N9$ = ACT$(I)
970     'make first word equal to record number...
980             LSET N1$ = MKI$(I)
990             PUT#1, I
1000    NEXT
1010    'last entry is all 255 chars...
1020    LSET N9$ = STRING$(30,255): LSET N2$ = MKI$(32767):
PUT#1
1030    CLOSE
1040 RETURN
1050    '
1060    '
1070    '___change_or_add_to_existing_shell_data_files_____
1080    '
```

```
1090     PRINT MID.SCRN$ WK.DATE$ " - " FILENAME$
1100     PRINT: PRINT"    Enter:"
1110     PRINT"           0 if no more changes or additions, a
ll done"
1120     PRINT"           1 to add activity data"
1130     PRINT"           2 to change activity data"
1140     PRINT"           3 to delete activity data"
1150     PRINT"  Which choice? ";: A = VAL(INPUT$(1)): PRINT
A
1160     '
1170     IF A = 0 THEN RETURN
1180     IF A > 3 THEN PRINT E$: GOTO 1150
1190     '
1200     'open shell data file and act.code file...
1210     GOSUB 2900: GOSUB 3290
1220     A.T = 0: N = 0
1230     WHILE A.T <> 32767
1240     N = N + 1
1250     GET#1, N: SEQ.NUM = CVI(N1$): A.T = CVI(N2$): IF (N
<> SEQ.NUM) AND (N <> -1) THEN PRINT"Error in " FILENAME$ "
record" N "n
ot equal to sequence number" SEQ.NUM
1260     WEND
1270     MAX.N = N
1280     '
1290     ON A GOSUB 1330, 1670, 1840
1300     CLOSE: GOTO 1090
1310     '
1320     'add a new activity to shell data file...
1330     N = MAX.N: GOSUB 2280: MAX.N = N
1340     DATA.TIME = -1
1350     WHILE DATA.TIME <= ACT.SCHED.TIME
1360              K = K + 1
1370              GET#1, K: DATA.TIME = CVI(N2$)
1380     WEND
1390     '#k is first record > than activity to insert...
1400     MEM = FRE(0): IF MEM < (MAX.N - K + 1)*32 THEN PRINT
"Not enough memory, moving one record at a time...": GOTO 15
40
1410     IF ACT$(0) <> CHR$(255) THEN ERASE ACT$: DIM ACT$(MA
X.N + 1 - K)
1420     FOR M = K TO MAX.N
1430              GET#1, M
1440              ACT$(M - K + 1) = N9$
1450     NEXT
1460     LSET N9$ = ACT.LN$: LSET N1$ = MKI$(K)
1470     PUT#1, K
1480     FOR M = K + 1 TO MAX.N + 1
1490              LSET N9$ = ACT$(M - K)
1500              LSET N1$ = MKI$(M)
1510              PUT#1, M
1520     NEXT
1530     GOTO 1640
1540     GET#1, K: TMP1$ = N9$
1550     LSET N9$ = ACT.LN$: LSET N1$ = MKI$(K)
```

```
1560     PUT#1, K
1570     FOR M = K + 1 TO MAX.N
1580              GET#1, M: TMP2$ = N9$
1590              LSET N9$ = TMP1$: LSET N1$ = M
1600              PUT#1, M
1610              TMP1$ = TMP2$
1620     NEXT
1630     LSET N9$ = TMP1$: PUT#1
1640     MAX.N = MAX.N + 1
1650 RETURN
1660     '
1670     PRINT MID.SCRN$ "Enter the sequence number to change
 or (? for help):";
1680     INPUT" ", A$
1690     IF A$ = "?" THEN GOSUB 1970 ELSE N = VAL(A$)
1700     IF N < 1 OR N > MAX.N THEN PRINT"Out of range...": G
OSUB 1970
1710     'good sequence number entered...
1720     GET#1, N
1730     SEQ.NUM = CVI(N1$): ACT.SCHED.TIME = CVI(N2$): ACT.C
ODE = ASC(N3$): PIL.NUM = ASC(N4$): ACT.ST.TIME = CVI(N5$):
ACT.END.TIME
 = CVI(N6$): ACT.NAME$ = N7$
1740     PRINT MID.SCRN$ SEQ.NUM; (ACT.SCHED.TIME MOD 1440);
ACT.NAME$
1750     PRINT"Enter 0 if this is the correct activity, 1 to
search further: ";
1760     A = VAL(INPUT$(1)): PRINT A
1770     IF A = 1 THEN GOTO 1670 ELSE IF A <> 0 THEN PRINT E$
: GOTO 1750
1780     '
1790     'add activity entry...
1800     A = 1
1810     GOSUB 2280
1820 RETURN
1830     '
1840     PRINT"Delete not written yet...": RETURN
1850     '
1860     '___delete_complete_shell_data_file_____________
1870     '
1880     PRINT MID.SCRN$ WK.DATE$ FILENAME$
1890     PRINT Enter 0 to delete this file, 1 to abort delete
 action"
1900     INPUT"Which one"; D
1910     IF D <> 0 THEN PRINT"Exiting delete mode, file NOT d
eleted...": FOR I = 1 TO 1000: NEXT: GOTO 1920
1920 RETURN
1930     '
1940     '___subroutines_____________________________________
1950     '
1960     'display shell file 20 lines at a time...
1970     M = 1: A.T = 0
1980     WHILE A.T <> 32767
1990     GET#1, M: S.N = CVI(N1$): A.T = CVI(N2$): A.C = ASC(
N3$): P.N = ASC(N4$): S.T = CVI(N5$): E.T = CVI(N6$): A.N$ =
```

```
 N7$
2000     IF A.T <> 32767 THEN PRINT S.N A.T A.C P.N S.T E.T A
.N$
2010     M = M + 1
2020     IF M MOD 20 = 1 THEN PRINT"Press <RETURN> to continu
e or sequence number if found:";: INPUT" ", A$: IF A$ = "" T
HEN GOTO 206
0 ELSE N = VAL(A$): GOTO 2050
2030     WEND
2040     PRINT"At end of shell data file for " WK.DATE$ ", "
FILENAME$: PRINT: PRINT"Press <RETURN> to start over or sequ
ence number
found:";: INPUT" ", A$: IF A$ = "" THEN GOTO 1970 ELSE N = V
AL(A$): GOTO 2050
2050     RETURN
2060     PRINT UP$ CLR.LINE$;: GOTO 1980
2070     '
2080     'get and confirm pilot number...
2090     PRINT MID.SCRN$;
2100     PRINT"Enter the last name or pilot number:";: INPUT"
 ", ANSWER$
2110     IF ASC(LEFT$(ANSWER$,1)) < 58 THEN NUM = VAL(ANSWER$
): THIS.NUM = -1 ELSE NUM = 0: L.NAME$ = ANSWER$
2120     'look for name match...
2130     WHILE NUM < MAX.PIL.NUM AND NOT THIS.NUM
2140              NUM = NUM + 1
2150              IF L.NAME$ = LEFT$(P$(NUM,2),LEN(L.NAME$)) T
HEN THIS.NUM = -1 ELSE THIS.NUM = 0
2160     WEND
2170     IF THIS.NUM = 0 THEN GOSUB 3060: PRINT: PRINT"Enter
pilot number: ";: INPUT NUM
2180     IF NUM = 0 THEN GOTO 2250
2190     PRINT MID.SCRN$ CVI(P$(NUM,1)) " - " P$(NUM,2) P$(NU
M,3) " " P$(NUM,4)
2200     PRINT"Enter 0 if this the correct entry; 1 if not co
rrect:";: THIS.NUM = VAL(INPUT$(1)): PRINT THIS.NUM
2210     IF THIS.NUM = 1 THEN THIS.NUM = 0: GOTO 2170
2220     IF THIS.NUM <> 0 THEN PRINT"Error, enter 0 or 1 only
...": GOTO 2190
2230     'have correct number...
2240     PIL.NUM = NUM
2250     RETURN
2260     '
2270     'input a new activity...
2280     PRINT"Enter activity code (? for help): ";
2290     INPUT" ", CODE$
2300     IF CODE$ = "?" THEN GOSUB 3340 ELSE IF CODE$ = "0" T
HEN GOTO 2780
2310     ACT.CODE = VAL(CODE$)
2320     IF ACT.CODE < 1 OR ACT.CODE > 255 THEN PRINT"Entry i
s out of range...": GOSUB 3340: GOTO 2310
2330     IF (ACT.CODE AND 63) = 63 THEN OTHER = -1 ELSE OTHER
 = 0
2340     IF OTHER THEN INPUT"What is the activity name? ", AC
T.NAME$: GOTO 2400
```

```
2350     GET#2, ACT.CODE
2360     TRIM$ = N22$
2370     GOSUB 2810
2380     ACT.NAME$ = TRIM$
2390     '
2400     PRINT MID.SCRN$;
2410     PRINT" Enter the day " ACT.NAME$ " occurs on:"
2420     PRINT"            1 - Sunday"
2430     PRINT"            2 - Monday"
2440     PRINT"            3 - Tuesday"
2450     PRINT"            4 - Wednesday"
2460     PRINT"            5 - Thursday"
2470     PRINT"            6 - Friday"
2480     PRINT"            7 - Saturday"
2490     PRINT"  Which day?";
2500     D = VAL(INPUT$(1))
2510     IF D < 1 OR D > 7 THEN PRINT"Error, enter a number 1
 to 7 only, try again...": GOTO 2490
2520     PRINT MID.SCRN$;
2530     PRINT"Enter the scheduled time: ";
2540     INPUT TIME$: GOSUB 3920
2550     ACT.SCHED.TIME = (D-1)*1440 + TIME
2560     IF OTHER THEN GOSUB 3580: GOTO 2660
2570     'not other...
2580     PRINT MID.SCRN$;
2590     PRINT"  Enter:"
2600     PRINT"            0 if standard time offsets apply"
2610     PRINT"            1 to change them"
2620     PRINT"  Which choice? ";: A$ = INPUT$(1): PRINT A$
2630     IF A$ = "1" THEN GOSUB 3580: GOTO 2660
2640     IF A$ <> "0" THEN PRINT E$: GOTO 2590
2650     START = CVI(N23$): END.T = CVI(N24$)
2660     ACT.ST.TIME = ACT.SCHED.TIME - START: ACT END TIME =
 ACT.SCHED.TIME + END.T
2670     PRINT MID.SCRN$ "Is a pilot already assigned to this
 activity?"
2680     PRINT"Enter 0 if no pilot assigned or the pilot name
 or number to specify which pilot: ";
2690     INPUT A$
2700     IF A$ <> "0" THEN ANSWER$ = A$: GOSUB 2110 ELSE PIL.
NUM = 255
2710     ACT.LN$ = STRING$(30,0)
2720     MID$(ACT.LN$,3,2) = MKI$(ACT SCHED TIME)
2730     MID$(ACT.LN$,5,1) = CHR$(ACT CODE)
2740     MID$(ACT.LN$,6,1) = CHR$(PIL.NUM)
2750     MID$(ACT.LN$,7,2) = MKI$(ACT.ST.TIME)
2760     MID$(ACT.LN$,9,2) = MKI$(ACT.END.TIME)
2770     MID$(ACT.LN$,11) = ACT.NAME$
2780 RETURN
2790     '
2800     'trim trailing spaces...
2810     L = LEN(TRIM$) + 1: L.CHR$ = CHR$(0)
2820     WHILE ASC(L.CHR$) < 33
2830              L = L - 1
2840              L.CHR$ = MID$(TRIM$,L,1)
```

```
2850     WEND
2860     TRIM$ = LEFT$(TRIM$,L)
2870 RETURN
2880     '
2890     'open and field shell data file...
2900     OPEN "R", 1, FILENAME$, 30
2910     '          seq.num act.sched.time act.code pil.num act
.st.time act.end.time act.name
2920     FIELD#1, 2 AS N1$, 2 AS N2$, 1 AS N3$, 1 AS N4$, 2 A
S N5$, 2 AS N6$, 20 AS N7$
2930     FIELD#1, 30 AS N9$
2940 RETURN
2950     '
2960     'dynamic array size increase...
2970     MEM = FRE(0): IF MEM < 320 THEN PRINT"Not enough fre
e memory, save this to disk and continue...": MEM = -1: RETU
RN
2980     IF TMP$(0) <> CHR$(255) THEN ERASE TMP$: DIM TMP$(MA
X.N)
2990     FOR M = 1 TO MAX.N: TMP$(M) = ACT$(M): NEXT
3000     ERASE ACT$: DIM ACT$(MAX.N + 10)
3010     FOR M = 1 TO MAX.N: ACT$(M) = TMP$(M): NEXT
3020     MAX.N = MAX.N + 10
3030     RETURN
3040     '
3050     'print all pilot names to screen...
3060     PRINT CLR$
3070     FOR I = 1 TO 20
3080     NUM = CVI(P$(I,1)): L.NAME$ = P$(I,2): INIT$ = P$(I,
3): RANK$ = P$(I,4)
3090     PRINT USING "###"; NUM;: PRINT " - " LEFT$(L.NAME$,1
1) INIT$ " " RANK$;
3100     NUM = CVI(P$(I+20,1)): L.NAME$ = P$(I+20,2): INIT$ =
 P$(I+20,3): RANK$ = P$(I+20,4)
3110     PRINT TAB(27) USING "###"; NUM;: PRINT " - " LEFT$(L
.NAME$,11) INIT$ " " RANK$;
3120     NUM = CVI(P$(I+40,1)): L.NAME$ = P$(I+40,2): INIT$ =
 P$(I+40,3): RANK$ = P$(I+40,4)
3130     PRINT TAB(55) USING "###"; NUM;: PRINT " - " LEFT$(L
.NAME$,11) INIT$ " " RANK$
3140     NEXT
3150     RETURN
3160     '
3170     'get pilot names from key file...
3180     FOR I = 1 TO MAX.PIL.NUM
3190          GET#1, I
3200          P$(I,1) = N1$: P$(I,2) = N2$: P$(I,3) = N3$:
 P$(I,4) = N4$
3210     NEXT
3220     RETURN
3230     '
3240     'open and field def files...
3250     OPEN "R", 1, "PILNAM.DEF", 27
3260     FIELD#1, 2 AS N1$, 20 AS N2$, 2 AS N3$, 3 AS N4$
3270     RETURN
```

```
3280      '
3290      OPEN "R", 2, "ACT.DEF", 46
3300      FIELD#2, 2 AS N21$, 20 AS N22$, 2 AS N23$, 2 AS N24$
, 10 AS N25$, 10 AS N26$
3310      RETURN
3320      '
3330      'read in activity codes and names, assumes def file
open as #2..
3340      PRINT"Select the desired activity category"
3350      PRINT"  1 for non-duty (leave, TDY, etc)"
3360      PRINT"  2 for non-flying duty activities"
3370      PRINT"  3 for flying activities"
3380      PRINT"Which category? ";: A = VAL(INPUT$(1)): PRINT
A
3390      GP = (A - 1)*64
3400      FOR I = 1 TO 21
3410        GET#2, I + GP
3420        ACT.CODE = CVI(N21$)
3430        ACT.NAME$ = N22$
3440        PRINT USING "###"; ACT.CODE;: PRINT " - " ACT.NAME
$;
3450        GET#2, I + GP + 21
3460        ACT.CODE = CVI(N21$)
3470        ACT.NAME$ = N22$
3480        PRINT TAB(27) USING "###"; ACT.CODE,: PRINT " - "
ACT.NAME$;
3490        GET#2, I + GP + 42
3500        ACT.CODE = CVI(N21$)
3510        ACT.NAME$ = N22$
3520        PRINT TAB(55) USING "###"; ACT.CODE;: PRINT " - "
ACT.NAME$
3530      NEXT
3540      PRINT: PRINT"Which activity code?";: INPUT" ", CODE$
3550      RETURN
3560      '
3570      'other, input start and end time offsets...
3580      PRINT MID.SCRN$;
3590      PRINT"Enter the amount of time (hrs:min) needed prio
r to the scheduled"
3600      PRINT"activity time (e.g. travel time to a meeting o
r briefing time)"
3610      PRINT: PRINT"How much time? ";: GOSUB 4190
3620      START = DUR
3630      PRINT MID.SCRN$;
3640      PRINT"Enter the amount of time for the activity, inc
lude debriefing, "
3650      PRINT"return travel, etc as applicable"
3660      PRINT: PRINT"How much time? ";: GOSUB 4190
3670      END.T = DUR
3680      RETURN
3690      '
3700      'sort activities...
3710      SWAP. = -1: LAST = MAX.N - 1
3720      PRINT MID.SCRN$ "Sorting";
3730      WHILE SWAP.
```

```
3740          SWAP. = 0
3750          FOR I = 1 TO LAST
3760               A.T1 = CVI(MID$(ACT$(I),3,2))
3770               A.T2 = CVI(MID$(ACT$(I+1),3,2))
3780               IF A.T1 > A.T2 THEN GOSUB 3840
3790          NEXT
3800          LAST = LAST - 1
3810          PRINT
3820     WEND
3830 RETURN
3840     PRINT".";
3850     TMP$ = ACT$(I+1)
3860     ACT$(I+1) = ACT$(I)
3870     ACT$(I) = TMP$
3880     SWAP. = -1
3890 RETURN
3900     '
3910     'time of day validating routine...
3920     NT = 0
3930     T$ = ""
3940     WHILE T$ <> ":" AND NT < LEN(TIME$)
3950               NT = NT + 1
3960               T$ = MID$(TIME$,NT,1)
3970     WEND
3980     IF NT = 0 GOTO 4120
3990     IF NT = LEN(TIME$) THEN NT = LEN(TIME$) - 1: MIN = V
AL(RIGHT$(TIME$,2)) ELSE MIN = VAL(RIGHT$(TIME$,LEN(TIME$) -
 NT))
4000     HR=VAL(LEFT$(TIME$,NT-1))
4010     BAD = 0
4020     IF MIN < 0 OR MIN > 59 THEN BAD = -1
4030     IF HR < 0 OR HR > 24 THEN BAD = -1
4040     TIME = HR*60 + MIN
4050     T$ = CHR$(HR\10+48)
4060     I$ = CHR$((HR MOD 10)+48)
4070     M$ = CHR$(MIN\10+48)
4080     E$ = CHR$((MIN MOD 10)+48)
4090     TIME$ = T$ + I$ + M$ + E$
4100     IF BAD THEN PRINT"Time " TIME$ " not understood, ple
ase re-enter:";: INPUT" ", TIME$: GOTO 3920
4110     NT = 0: T$ = "": I$ = "": M$ = "": E$ = "": BAD = 0:
 HR = 0: MIN = 0
4120 RETURN
4130     '
4140 '
4150 '   --- This routine accepts an input of numbers until
4160 '            a colon is keyed, then allows only two
4170 '            digits up to a value of 60 ..
4180 '
4190     CK$ = ""
4200     DIGIT$ = INPUT$(1)
4210     IF ASC(DIGIT$)<48 OR ASC(DIGIT$)>58 THEN PRINT "Nume
rical digits or colon (:) only, please re-enter: ",: GOTO 42
00
4220     CK$ = CK$ + DIGIT$
```

```
4230     IF RIGHT$(CK$,1) <> ":" THEN 4200
4240     HR = VAL(LEFT$(CK$,LEN(CK$)-1))
4250     MIN$ = INPUT$(2)
4260     IF VAL(MIN$) > 60 THEN PRINT "Max number of minutes
is 60, please re-enter: ": GOTO 4250
4270     MIN = VAL(MIN$)
4280     CK$ = CK$ + MIN$
4290     PRINT: PRINT "The interval entered is: " CK$ ", is t
his correct?"
4300     PRINT C$;: A$ = INPUT$(1): PRINT A$
4310     IF A$ = "1" THEN PRINT"Re-enter interval from beginn
ing: ": GOTO 4190
4320     IF A$ <> "0" THEN PRINT E$: GOTO 4300
4330     DUR = HR*60 + MIN
4340 RETURN
4350 '  ------------------------------------------------------
4360     '
4370     IF MONTH$(0) <> CHR$(255) THEN ERASE MONTH$
4380     DIM MONTH$(12)
4390     MONTH$(1) = "JAN"
4400     MONTH$(2) = "FEB"
4410     MONTH$(3) = "MAR"
4420     MONTH$(4) = "APR"
4430     MONTH$(5) = "MAY"
4440     MONTH$(6) = "JUN"
4450     MONTH$(7) = "JUL"
4460     MONTH$(8) = "AUG"
4470     MONTH$(9) = "SEP"
4480     MONTH$(10) = "OCT"
4490     MONTH$(11) = "NOV"
4500     MONTH$(12) = "DEC"
4510     '
4520     IF FIRST.DAY(0) = 0 THEN ERASE FIRST.DAY
4530     DIM FIRST.DAY(12)
4540     '
4550     'reset FIRST.DAY(3..12) if correcting a date...
4560     '
4570     FIRST.DAY(1) = 1
4580     FIRST.DAY(2) = 32
4590     FIRST.DAY(3) = 60
4600     FIRST.DAY(4) = 91
4610     FIRST.DAY(5) = 121
4620     FIRST.DAY(6) = 152
4630     FIRST.DAY(7) = 182
4640     FIRST.DAY(8) = 213
4650     FIRST.DAY(9) = 244
4660     FIRST.DAY(10) = 274
4670     FIRST.DAY(11) = 305
4680     FIRST.DAY(12) = 335
4690     '
4700     '--- get the date ---
4710     '
4720     INPUT"What is the date <Day Month Year>", DATE$
4730     IF DATE$ = "0" THEN DATE = 0: RETURN
4740     '
```

```
4750     'put the date chars in individual variables...
4760     '
4770     IF D$(0) <> CHR$(255) THEN ERASE D$
4780     DIM D$(LEN(DATE$))
4790     FIRST.DLMTR = 0
4800     '
4810     FOR I.V = 1 TO LEN(DATE$)
4820              D$(I.V) = MID$(DATE$,I.V,1)
4830              IF FIRST.DLMTR <> 0 THEN 4930
4840     'if first delimiter not set, look for it; allow
4850     'almost any char except letters or numbers to
4860     'delimit...
4870              D = ASC(D$(I.V))
4880              IF D < 48 THEN DLMT = -1
4890              IF (D > 57 AND D < 65) THEN DLMT = -1
4900              IF (D > 90 AND D < 96) THEN DLMT = -1
4910              IF DLMT THEN FIRST.DLMTR = I.V
4920              DLMT = 0
4930     NEXT
4940     '
4950     'assume the last two chars are the year..
4960     '
4970     YEAR = VAL(RIGHT$(DATE$,2))
4980     '
4990     'find the day...
5000     'if a delimiter was found then day is the value
5010     'before the delimiter, otherwise the day is either
5020     'the first character or the first two characters of
5030     'the string--assume the first two characters if the
5040     'second character is not a letter
5050     '
5060     IF FIRST.DLMTR THEN DAY = VAL(LEFT$(DATE$,FIRST.DLMT
R - 1)) ELSE IF ASC(D$(2)) < 58 THEN DAY = VAL(LEFT$(DATE$,2
)): FIRST.DL
MTR = 2 ELSE DAY = VAL(LEFT$(DATE$,1)): FIRST.DLMTR = 1
5070     '
5080     'find the month...
5090     'just look at three characters past the day or past
5100     'the first delimiter
5110     '         - month could be a number or letters
5120     '         - convert lower case letters to upper
5130     '
5140     MONTH$=""
5150     MON.NUM = 0
5160     FOR I.V = 1 TO 3
5170              IF ASC(D$(FIRST.DLMTR+I.V)) < 58 THEN MON.NU
M = -1
5180              IF ASC(D$(FIRST.DLMTR+I.V)) > 96 THEN D$(FIR
ST.DLMTR+I.V) = CHR$(ASC(D$(FIRST.DLMTR+I.V))-32)
5190              MONTH$ = MONTH$ + D$(FIRST.DLMTR+I.V)
5200     NEXT
5210     '
5220     'MONTH$ is now a string of numbers or letters,
5230     '         MON.NUM is TRUE if it is numbers...
5240     '
```

```
5250     IF MON.NUM THEN MONTH=VAL(LEFT$(MONTH$,2)): GOTO 533
0
5260     FOR I.V = 1 TO 12
5270              FOR J.V = 1 TO 3
5280                       IF MID$(MONTH$,J.V,1) = MID$(MONTH$(
I.V),J.V,1) THEN TEST = -1 ELSE TEST = 0
5290                       IF NOT TEST GOTO 5320: ' one not mat
ching is enough
5300              NEXT J.V
5310              IF TEST THEN MONTH = I.V: GOTO 5330: ' found
 a match
5320     NEXT I.V
5330     IF MONTH < 1 OR MONTH > 12 THEN INPUT"Month not unde
rstood--enter the month as a one or two digit number (1..12)
", MONTH: GO
TO 5330
5340     '
5350     'MONTH is now valid, set MONTH$ if reqd...
5360     '
5370     IF MON.NUM THEN MONTH$ = MONTH$(MONTH)
5380     '
5390     'check if this is a leap year...
5400     '
5410     IF YEAR/4 = YEAR\4 THEN LEAP.YEAR = -1 ELSE LEAP.YEA
R = 0
5420     '
5430     'if so must increment first day values after
5440     '        February...
5450     '
5460     IF LEAP.YEAR THEN FOR I.V = 3 TO 12: FIRST.DAY(I.V)
= FIRST.DAY(I.V) + 1: NEXT
5470     '
5480     'make sure the number of days is valid for the month
5490     'first, compute max days in month...
5500     IF MONTH = 12 THEN MAX.DAY$ = " 31" ELSE MAX.DAY$ =
STR$(FIRST.DAY(MONTH + 1) - FIRST.DAY(MONTH))
5510     MAX.DAY$ = MID$(MAX.DAY$,2,2)
5520     '        then check range
5530     IF DAY < 1 OR DAY > VAL(MAX.DAY$) THEN PRINT "Day of
 month not understood--input day as a number (1.." MAX.DAY$
")";: INPUT"
", DAY
5540     '
5550     'now put it together and see if correct...
5560     '
5570     DAY$ = STR$(DAY): YR$ = STR$(YEAR): DATE$ = DAY$ + "
" + MONTH$ + YR$
5580     PRINT"The date entered is: "; DATE$
5590     PRINT: PRINT C$;
5600     A$ = INPUT$(1)
5610     IF A$ = "1" THEN GOTO 4570: 'try again...
5620     IF A$ <> "0" THEN PRINT E$: GOTO 5580
5630     '
5640     'date is valid and checked correct, make the julian
5650     '     date...
```

```
5660      '         julian date form is year digit * 1000 + juli
an date
5670      '
5680      DATE = VAL(RIGHT$(STR$(YEAR),1))*1000 + FIRST.DAY(MO
NTH) + DAY -1
5690      '
5700      'reset all variables not needed
5710      '
5720      ERASE D$
5730      YEAR = 0: MONTH = 0: DAY = 0: MON.NUM = 0
5740      FIRST.DLMTR = 0: A$ = "": MAX.DAY$ = ""
5750      DAY$ = "": MONTH$ = "": YR$ = ""
5760 RETURN
5770      '
```

```
100       '*** WKDAT.SET ************************************
110       'program dated 17 May 1983
120       '
130       'This program reads all pilnn.dat files and sets
140       '         the weekly data in WKnn.DAT
150       '
160       'variables required:
170       '         none
180       '
190       'returns:
200       '         WKnn.DAT file
210       '
220       DEFINT A-Z
230       CLR$ = CHR$(26): DOWN$ = CHR$(10): ESC$ = CHR$(27)
240       MID.SCRN$ = CLR$ + STRING$(8,10)
250       UP$ = CHR$(11): MOV.LEFT$ = CHR$(8): MOV.RIGHT$ = CH
R$(12)
260       HOME$ = CHR$(30): CLR.LINE$ = ESC$ + "T"
270       'set avail period constants...
280       PERIOD.ST.TIME = 0: PERIOD.DUR = 10080: INCR = 30
290       'char positions of date/time in act$...
300       SD = 6: ST = 11: ED = 16: ET = 21
310       'fndt.tim pulls the substring value from act$
320       DEF FNDT.TIM(NL,P) = VAL(MID$(ACT$(NL),P,5))
330       '
340       C$ = "Enter: 0 if correct, 1 to change it: "
350       E$ = "Error, enter 0 or 1 only, try again..."
360       '
370       MAX.PIL.NUM = 60
380       IF P$(0,0) <> CHR$(255) THEN ERASE P$: DIM P$(MAX.PI
L.NUM,4)
390       IF QUAL$(0) <> CHR$(255) THEN ERASE QUAL$: DIM QUAL$
(15)
400       '
410       'open and field def files...
420       OPEN "R", 1, "PILNAM.DEF", 27
430       '         pil.num:   l.name$:    init$:     rank$:
440       FIELD#1, 2 AS N1$, 20 AS N2$, 2 AS N3$, 3 AS N4$
450       '
460       PRINT MID.SCRN$ "Enter the week starting date (Sunda
y):"
470       GOSUB 1730
480       WK.DATE = DATE: WK.DATE$ = DATE$: WK.NUM = (WK.DATE
MOD 1000)\7: WK.NUM$ = MID$(STR$(WK.NUM),2)
490       PRINT"The week number is " WK.NUM$
500       '
510       OPEN "R", 2, "WK" + WK.NUM$ + ".DAT", 93
520       '         pil.num:    avail$:      cur.dt$:     qual:
   net/nlt:
530       FIELD#2, 1 AS N21$, 42 AS N22$, 20 AS N23$, 2 AS N24
$, 28 AS N25$
540       FIELD#2, 93 AS N2A$
550       '
560       FOR PIL.NUM = 1 TO MAX.PIL.NUM
570                 FOR I = 1 TO 7: NET(I) = -1: NLT(I) = -1: NE
```

```
XT
580               GET#1, PIL.NUM
590               NUM = CVI(N1$): TRIM$ = N2$: GOSUB 1460  L.N
AME$ = TRIM$: INIT$ = N3$: RANK$ = N4$
600               PRINT"Getting data on " RANK$ " " L.NAME$ ",
 " INIT$
610               IF NUM <> PIL.NUM THEN PRINT"File error: rec
ord number not equal to pilot number"  PRINT"Press any key t
o continue..
.";: DUMMY$ = INPUT$(1)
620               NUM$ = MID$(STR$(NUM),2)
630      '
640               NO.FILE = 0
650               ON ERROR GOTO 680
660               FILENAME$ = "PIL" + NUM$ + ".DAT"
670               OPEN "I", 3, FILENAME$
680               IF ERR = 53 THEN NO.FILE = -1: PRINT FILENAM
E$ " not found, going to next number...": RESUME 690
690               ON ERROR GOTO 0
700               IF NO.FILE THEN LSET N2A$ = STRING$(93,0): L
SET N21$ = CHR$(PIL.NUM): GOTO 1280
710      '
720      'read in pilot data file...
730               GOSUB 1550
740      'close pilot data file...
750               CLOSE#3
760      '
770      'make data for each week data record field...
780               LSET N21$ = CHR$(NUM)
790      '
800               AVAIL$ = STRING$(42,255)
810               FOR N = 1 TO MAX.N
820                        ACT.CODE = VAL(LEFT$(ACT$(N),5))
830                        ACT.ST.DATE = FNDT.TIM(N,SD)
840                        ACT.ST.TIME = FNDT.TIM(N,ST)
850                        ACT.END.DATE = FNDT.TIM(N,ED)
860                        ACT.END.TIME = FNDT.TIM(N,ET)
870      '
880      'compute times in minutes from week beginning...
890      '
900                        IF ACT.ST.DATE - WK.DATE > 7 THEN ST
ART.TIME = 32767 ELSE IF ACT.ST.DATE - WK.DATE < -7 THEN STA
RT TIME = -1
0080 ELSE START.TIME = (ACT.ST.DATE - WK.DATE)*1440 + ACT.ST
.TIME
910                        IF ACT.END.DATE - WK.DATE > 7 THEN E
ND.TIME = 32767 ELSE IF ACT.END.DATE - WK DATE < -7 THEN END
.TIME = -100
80 ELSE END.TIME = (ACT.END.DATE - WK.DATE)*1440 + ACT.END.T
IME
920      'Set defined FALSE, just check activity times ..
930                        AVAIL=-1: SET=0
940                        GOSUB 3380
950                        IF NOT AVAIL THEN PRINT"Conflict in
activity" N CHR$(8) ", not set. ."
```

```
960                         IF (ACT.CODE AND 192) <> 0 THEN GOSU
B 5150 ELSE C.REST = -1
970                         IF C.REST THEN GOTO 1030
980                         PRINT"Activity" N "-"ACT$(N) "does n
ot meet crew rest constraints..."
990                         PRINT"Enter: 0 to ignore crew rest,
1 to NOT set this activity: ";
1000                        A$ = INPUT$(1): PRINT A$
1010                        IF A$ = "1" THEN GOTO 1040 ELSE IF A
$ <> "0" THEN PRINT E$: GOTO 980
1020    'set defined TRUE, set this activity in avail$...
1030                        AVAIL = -1: SET = -1: GOSUB 3810
1040            NEXT: 'activity for this pilot number...
1050            LSET N22$ = AVAIL$
1060    '
1070            CUR.DT$ = ""
1080            FOR N = 1 TO 10
1090                        CUR.DT$ = CUR.DT$ + MKI$(CUR.DT(N))
1100            NEXT: 'currency event date...
1110            LSET N23$ = CUR.DT$
1120    '
1130            QUAL = 0
1140            FOR N = 1 TO 15
1150                        IF QV(N) THEN QUAL = QUAL + 2^(N-1)
1160            NEXT: 'qualification...
1170            LSET N24$ = MKI$(QUAL)
1180    '
1190    'initialize all NET and NLT times as -1 values...
1200            NET.NLT$ = STRING$(28,255)
1210            FOR N = 1 TO 7
1220                        IF NET(N) <> -1 THEN MID$(NET.NLT$,N
*4 - 3,2) = MKI$(NET(N))
1230                        IF NLT(N) <> -1 THEN MID$(NET.NLT$,N
*4 - 1,2) = MKI$(NLT(N))
1240            NEXT
1250            LSET N25$ = NET.NLT$
1260    '
1270    'save all data in buffer to this pilot number record
1280            PUT#2, PIL.NUM
1290    NEXT: 'pilot number...
1300    '
1310    'last record, save the date (julian number and strin
g form)
1320    '         rec.num:     wk.date:     wk.date$:    not use
d:
1330    FIELD#2, 1 AS N221$, 2 AS N222$, 9 AS N223$, 81 AS N
224$
1340    LSET N221$ = CHR$(MAX.PIL.NUM + 1)
1350    LSET N222$ = MKI$(WK.DATE)
1360    LSET N223$ = WK.DATE$
1370    LSET N224$ = STRING$(81,0)
1380    PUT#2, MAX.PIL.NUM + 1
1390    '
1400    'all pilot data for the week now in one file
1410    PRINT"WK" WK.NUM$ ".DAT file now completed.  "
```

```
1420     END
1430     '
1440     '___subroutines_____________________________________________
1450     '
1460     L = LEN(TRIM$) + 1: L.CHR$ = CHR$(0)
1470     WHILE ASC(L.CHR$) < 33
1480              L = L - 1
1490              L.CHR$ = MID$(TRIM$,L,1)
1500     WEND
1510     TRIM$ = LEFT$(TRIM$,L)
1520 RETURN
1530     '
1540     'open data file and read into memory, close...
1550     INPUT #3, NUM$, L.NAME$, F.NAME$, MI$, RANK$, SSAN$
1560     IF EOF(3) THEN GOTO 1690 ELSE INPUT#3, QUAL.ID$
1570     IF QUAL.ID$ <> "QUALIFICATIONS:" THEN PRINT"Qual dat
a not found":
1580     IF QV(0) <> -1 THEN ERASE QV: DIM QV(15)
1590     FOR I = 1 TO 15: IF EOF(3) THEN GOTO 1680 ELSE INPUT
#3, QV(I): NEXT
1600     IF EOF(3) THEN GOTO 1680 ELSE INPUT#3, CUR.ID$
1610     IF CUR.ID$ <> "CURRENCIES:" THEN PRINT"Cur data not
found":
1620     FOR I = 1 TO 10: IF EOF(3) THEN GOTO 1680 ELSE INPUT
#3, CUR.DT(I): NEXT
1630     IF EOF(3) THEN GOTO 1680 ELSE INPUT#3, ACT.ID$, MAX.
N
1640     IF ACT.ID$ <> "ACTIVITIES SCHEDULED:" THEN PRINT"Act
ivity data not found":
1650     FOR N = 1 TO MAX.N
1660              IF EOF(3) THEN PRINT"EOF before MAX.N..." MA
X.N N;: DUMMY$ = INPUT$(1): GOTO 1680
1670              LINE INPUT#3, ACT$(N)
1680     NEXT
1690 RETURN
1700     '
1710 '  ____________________________________________________________
1720     '
1730     IF MONTH$(0) <> CHR$(255) THEN ERASE MONTH$
1740     DIM MONTH$(12)
1750     MONTH$(1) = "JAN"
1760     MONTH$(2) = "FEB"
1770     MONTH$(3) = "MAR"
1780     MONTH$(4) = "APR"
1790     MONTH$(5) = "MAY"
1800     MONTH$(6) = "JUN"
1810     MONTH$(7) = "JUL"
1820     MONTH$(8) = "AUG"
1830     MONTH$(9) = "SEP"
1840     MONTH$(10) = "OCT"
1850     MONTH$(11) = "NOV"
1860     MONTH$(12) = "DEC"
1870     '
1880     IF FIRST.DAY(0) = 0 THEN ERASE FIRST.DAY
1890     DIM FIRST.DAY(12)
```

```
1900      '
1910      'reset FIRST.DAY(3..12) if correcting a date...
1920      '
1930      FIRST.DAY(1) = 1
1940      FIRST.DAY(2) = 32
1950      FIRST.DAY(3) = 60
1960      FIRST.DAY(4) = 91
1970      FIRST.DAY(5) = 121
1980      FIRST.DAY(6) = 152
1990      FIRST.DAY(7) = 182
2000      FIRST.DAY(8) = 213
2010      FIRST.DAY(9) = 244
2020      FIRST.DAY(10) = 274
2030      FIRST.DAY(11) = 305
2040      FIRST.DAY(12) = 335
2050      '
2060      '--- get the date ---
2070      '
2080      INPUT"What is the date (Day Month Year)", DATE$
2090      IF DATE$ = "0" THEN DATE = 0: RETURN
2100      '
2110      'put the date chars in individual variables...
2120      '
2130      IF D$(0) <> CHR$(255) THEN ERASE D$
2140      DIM D$(LEN(DATE$))
2150      FIRST.DLMTR = 0
2160      '
2170      FOR I.V = 1 TO LEN(DATE$)
2180              D$(I.V) = MID$(DATE$,I.V,1)
2190              IF FIRST.DLMTR <> 0 THEN 2290
2200      'if first delimiter not set, look for it; allow
2210      'almost any char except letters or numbers to
2220      'delimit...
2230              D = ASC(D$(I.V))
2240              IF D < 48 THEN DLMT = -1
2250              IF (D > 57 AND D < 65) THEN DLMT = -1
2260              IF (D > 90 AND D < 96) THEN DLMT = -1
2270              IF DLMT THEN FIRST.DLMTR = I.V
2280              DLMT = 0
2290      NEXT
2300      '
2310      'assume the last two chars are the year...
2320      '
2330      YEAR = VAL(RIGHT$(DATE$,2))
2340      '
2350      'find the day...
2360      'if a delimiter was found then day is the value
2370      'before the delimiter, otherwise the day is either
2380      'the first character or the first two characters of
2390      'the string--assume the first two characters if the
2400      'second character is not a letter
2410      '
2420      IF FIRST.DLMTR THEN DAY = VAL(LEFT$(DATE$,FIRST.DLMT
R - 1)) ELSE IF ASC(D$(2)) < 58 THEN DAY = VAL(LEFT$(DATE$,2
)): FIRST.DL
```

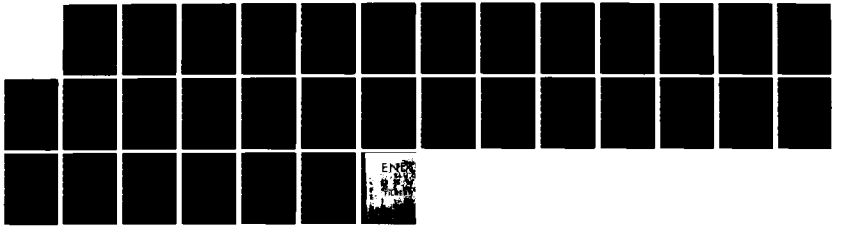
```
MTR = 2 ELSE DAY = VAL(LEFT$(DATE$,1)) : FIRST.DLMTR = 1
2430     '
2440     'find the month...
2450     'just look at three characters past the day or past
2460     'the first delimiter
2470     '        - month could be a number or letters
2480     '        - convert lower case letters to upper
2490     '
2500     MONTH$=""
2510     MON.NUM = 0
2520     FOR I.V = 1 TO 3
2530              IF ASC(D$(FIRST.DLMTR+I.V)) < 58 THEN MON.NU
M = -1
2540              IF ASC(D$(FIRST.DLMTR+I.V)) > 96 THEN D$(FIR
ST.DLMTR+I.V) = CHR$(ASC(D$(FIRST.DLMTR+I.V))-32)
2550              MONTH$ = MONTH$ + D$(FIRST.DLMTR+I.V)
2560     NEXT
2570     '
2580     'MONTH$ is now a string of numbers or letters,
2590     '        MON.NUM is TRUE if it is numbers
2600     '
2610     IF MON.NUM THEN MONTH=VAL(LEFT$(MONTH$,2)) : GOTO 269
0
2620     FOR I.V = 1 TO 12
2630              FOR J.V = 1 TO 3
2640                       IF MID$(MONTH$,J.V,1) = MID$(MONTH$(
I.V),J.V,1) THEN TEST = -1 ELSE TEST = 0
2650                       IF NOT TEST GOTO 2680 : ' one not mat
ching is enough
2660              NEXT J.V
2670              IF TEST THEN MONTH = I.V : GOTO 2690 : ' found
 a match
2680     NEXT I.V
2690     IF MONTH < 1 OR MONTH > 12 THEN INPUT"Month not unde
rstood--enter the month as a one or two digit number (1..12)
", MONTH : GO
TO 2690
2700     '
2710     'MONTH is now valid, set MONTH$ if reqd...
2720     '
2730     IF MON.NUM THEN MONTH$ = MONTH$(MONTH)
2740     '
2750     'check if this is a leap year...
2760     '
2770     IF YEAR/4 = YEAR\4 THEN LEAP.YEAR = -1 ELSE LEAP.YEA
R = 0
2780     '
2790     'if so must increment first day values after
2800     '        February...
2810     '
2820     IF LEAP.YEAR THEN FOR I.V = 3 TO 12 : FIRST.DAY(I.V)
= FIRST.DAY(I.V) + 1 : NEXT
2830     '
2840     'make sure the number of days is valid for the month
2850     'first, compute max days in month...
```

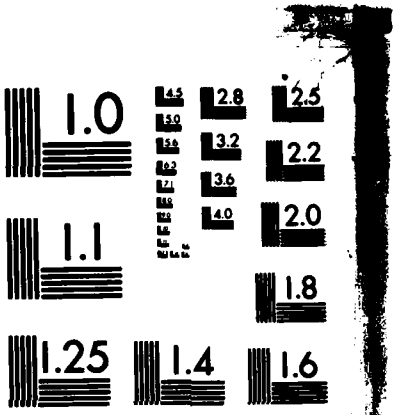
```
2860     IF MONTH = 12 THEN MAX.DAY$ = " 31" ELSE MAX.DAY$ =
STR$(FIRST.DAY(MONTH + 1) - FIRST.DAY(MONTH))
2870     MAX.DAY$ = MID$(MAX.DAY$,2,2)
2880     '         then check range
2890     IF DAY < 1 OR DAY > VAL(MAX.DAY$) THEN PRINT "Day of
 month not understood--input day as a number <1.." MAX.DAY$
")";: INPUT"
", DAY
2900     '
2910     'now put it together and see if correct...
2920     '
2930     DAY$ = MID$(STR$(DAY),2): YR$ = STR$(YEAR): DATE$ =
DAY$ + " " + MONTH$ + YR$
2940     PRINT"The date entered is: "; DATE$
2950     PRINT: PRINT C$;
2960     A$ = INPUT$(1)
2970     IF A$ = "1" THEN GOTO 1930 'try again...
2980     IF A$ <> "0" THEN PRINT E$: GOTO 2940
2990     '
3000     'date is valid and checked correct, make the julian
3010     '    date. .julian date form is
3020     '         year digit * 1000 + julian date
3030     '
3040     DATE = VAL(RIGHT$(STR$(YEAR),1))*1000 + FIRST.DAY(MO
NTH) + DAY -1
3050     '
3060     'reset all variables not needed
3070     '
3080     ERASE D$
3090     YEAR = 0: MONTH = 0: DAY = 0: MON.NUM = 0
3100     FIRST.DLMTR = 0: A$ = "": MAX.DAY$ = ""
3110     DAY$ = "": MONTH$ = "": YR$ = ""
3120 RETURN
3130     '
3140     '*** CASE ***
3150     'module dated 24 April 1983
3160     '
3170     'This module includes subroutines called by other
3180     'modules in determining the case of each activity
3190     'relative to the week
3200     '
3210     'variables rquired:
3220     '         PERIOD.ST.TIME as an integer in minutes or o
ther time units
3230     '         PERIOD.DUR as an integer length of period
3240     '         INCR as an integer for the value of each bit
 (resolution)
3250     '         START.TIME as values for the activity
3260     '         END.TIME                    "
3270     '         AVAIL$ as a bit string with '1' available, '
0' not avail
3280     '         AVAIL as a control code
3290     '         SET as a control code to set the time 'not a
vailable'
3300     '
```

```
3310     'returns:
3320     '        AVAIL as TRUE if time is available
3330     '        AVAIL$ updated if AVAIL and SET both TRUE
3340     '
3350     'subroutines used:
3360     '        all internal
3370     '
3380     GOSUB 3600
3390     GOSUB 3810
3400     RETURN
3410     '-------------------------------------------------------------
3420 '
3430 '   --- This routine determines the case of activity
3440 '           start (CASE1) and end (CASE2) relative to
3450 '           the period start and end...
3460 '
3470 '           CASE1 and CASE2 equal 1 if times are before
3480     '       the period starts, 2 if during the period,
3490     '       or 3 if after the period.  Thus if CASE1 is
3500     '       3 or CASE2 is 1, the whole activity falls
3510     '       outside the period in question.  If both
3520     '       CASE1 and CASE2 are 2, then the whole
3530     '       activity is within the period
3540 '
3550 '           CASE3 has a value of 1 if the whole
3560     '       activity falls on a single byte, 2 if on
3570     '       adjacent bytes, and 3 if one or more whole
3580     '       bytes fall between the start and end.
3590 '
3600     START.BIT = START.TIME\INCR
3610     START.BYTE = START.BIT\8 + 1
3620     END.BIT = (END.TIME-1)\INCR
3630     END.BYTE = END.BIT\8 + 1
3640     IF START.TIME >= PERIOD.ST.TIME THEN COND1 = -1 ELSE
 COND1 = 0
3650     IF START.TIME < (PERIOD.ST.TIME + PERIOD.DUR) THEN C
OND2 = -1 ELSE COND2 = 0
3660     IF COND1 AND COND2 THEN CASE1 = 2 ELSE IF NOT COND1
THEN CASE1 = 1 ELSE IF NOT COND2 THEN CASE1 = 3
3670     IF END.TIME > PERIOD.ST.TIME THEN COND3 = -1 ELSE CO
ND3 = 0
3680     IF END.TIME <= (PERIOD.ST.TIME+PERIOD.DUR) THEN COND
4 = -1 ELSE COND4 = 0
3690     IF COND3 AND COND4 THEN CASE2 = 2 ELSE IF NOT COND3
THEN CASE2 = 1 ELSE IF NOT COND4 THEN CASE2 = 3
3700     IF END.BYTE = START.BYTE THEN CASE3 = 1
3710     IF END.BYTE - START.BYTE = 1 THEN CASE3 = 2
3720     IF END.BYTE - START.BYTE > 1 THEN CASE3 = 3
3730 RETURN
3740 '-------------------------------------------------------------
3750 '
3760 '  This routine selects the proper routine for
3770     'checking or setting availability based on the case
3780     'defined by CASE1, CASE2, and CASE3...
3790 '
```

AD-A133 271 COMPUTER ASSISTED SCHEDULING FOR AIR FORCE TACTICAL FIGHTER SQUADRONS(U) ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KS B C DUGLE 03 JUN 83 2/2

UNCLASSIFIED SBI-AD-E750 845 F/G 12/1 NL





```
3800 '            if start is before period...
3810     IF CASE1=1 AND CASE2=2 THEN ON CASE3 GOSUB 3970,4070
,4070
3820 '            if start and end are during period..
3830     IF CASE1=2 AND CASE2=2 THEN ON CASE3 GOSUB 4200,4370
,4330
3840 '            if start is during period but end is after..

3850     IF CASE1=2 AND CASE2=3 THEN ON CASE3 GOSUB 4550,4680
,4680
3860 '            if start is before and end is after period..

3870     IF CASE1=1 AND CASE2=3 THEN FIRST.BYT=1: LAST.BYT=LE
N(AVAIL$): GOSUB 4720
3880 '            the final case ends before or starts after
3890     '        period...
3900     IF CASE1=3 OR CASE2=1 THEN PRINT"Activity is complet
ely outside the period..."
3910 RETURN
3920 '  ------------------------------------------------------
3930 '
3940 '   --- This routine is used when END.BYTE$ is the
3950     '        first byte of AVAIL$...
3960 '
3970     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
3980     BYT.TO.CK$ = LEFT$(AVAIL$,1)
3990     GOSUB 4940
4000     IF AVAIL AND SET THEN MID$(AVAIL$,1,1) = CHR$(ASC(BY
T.TO.CK$) AND (NOT MASK))
4010 RETURN
4020 '  ------------------------------------------------------
4030 '
4040 '   --- This routine is used when END.BYTE points to
4050     '        end byte...
4060 '
4070     FIRST.BYT = 1: LAST.BYT =  END.BYTE-1
4080     GOSUB 4820
4090     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
4100     BYT.TO.CK$ = MID$(AVAIL$,END.BYTE,1): J = END.BYTE
4110     GOSUB 4940
4120     IF AVAIL AND SET THEN GOSUB 5060 ELSE RETURN
4130     MID$(AVAIL$,END.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND (
NOT MASK))
4140 RETURN
4150 '  ------------------------------------------------------
4160 '
4170 '  --- This routine is used for the single byte case
4180     '      where one byte includes both start and end...
4190 '
4200     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
4210     MASK = 0
4220     FIRST.BIT.USED = (START.BIT MOD 8)
4230     LAST.BIT.USED = (END.BIT MOD 8)
4240     GOSUB 4940
4250     IF AVAIL AND SET THEN MID$(AVAIL$,START.BYTE,1) = CH
```

```
R$(ASC(BYT.TO.CK$) AND (NOT MASK))
4260 RETURN
4270 '  ------------------------------------------------------------
4280 '
4290 '   --- This routine is used when one or more bytes
4300 '          separate the first and last bytes or when
4310 '          they are adjacent...
4320 '
4330     FIRST.BYT = START.BYTE+1: LAST.BYT = END.BYTE-1
4340     GOSUB 4820
4350     IF NOT AVAIL THEN RETURN
4360 '           CASE3 = 2 enters here...
4370     FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
7
4380     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
4390     GOSUB 4940
4400     IF AVAIL AND SET THEN MASK.ST=MASK.: BYT.ST$=BYT.TO.C
K$ ELSE IF NOT AVAIL THEN RETURN
4410     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
4420     BYT.TO.CK$ = MID$(AVAIL$,END.BYTE,1): J = END.BYTE
4430     GOSUB 4940
4440     IF NOT AVAIL THEN RETURN
4450     IF (CASE3=3) AND (AVAIL AND SET) THEN GOSUB 5060
4460     IF NOT(AVAIL AND SET) THEN RETURN
4470     MID$(AVAIL$,START.BYTE,1) = CHR$(ASC(BYT.ST$) AND (N
OT MASK.ST))
4480     MID$(AVAIL$,END.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND (
NOT MASK))
4490 RETURN
4500 '  ------------------------------------------------------------
4510 '
4520 '   --- This routine is used when the last byte in the
4530 '          string is the only byte to be checked...
4540 '
4550     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
4560     FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
(PERIOD.END.BIT MOD 8)
4570     GOSUB 4940
4580     IF AVAIL AND SET THEN MID$(AVAIL$,START.BYTE,1) = CH
R$(ASC(BYT.TO.CK$) AND (NOT MASK))
4590 RETURN
4600 '  ------------------------------------------------------------
4610 '
4620 '   --- This routine is used when the activity ends
4630 '          after the period and the first byte is one
4640 '          or more bytes from the end of AVAIL$.  The
4650 '          last two cases of CASE3 are both checked by
4660 '          this routine...
4670 '
4680     FIRST.BIT.USED = (START.BIT MOD 8)  LAST.BIT.USED =
7
4690     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
4700     GOSUB 4940
4710     FIRST.BYT = START.BYTE+1: LAST.BYT = LEN(AVAIL$)
4720     GOSUB 4820
```

```
4730     IF AVAIL AND SET THEN GOSUB 5060 ELSE RETURN
4740     MID$(AVAIL$,START.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND
 (NOT MASK))
4750 RETURN
4760 '  ------------------------------------------------------------
4770 '
4780 '   --- This routine is used by the routines above when
4790 '         whole bytes are being checked for
4800 '         availability...
4810 '
4820     FOR J = FIRST.BYT TO LAST.BYT
4830             BYT.TO.CK$ = MID$(AVAIL$,J,1)
4840             IF BYT.TO.CK$ <> CHR$(255) THEN FIRST.BIT.US
ED=0: LAST.BIT.USED=7: GOSUB 4940
4850             IF NOT AVAIL THEN RETURN
4860     NEXT
4870 RETURN
4880 '  ------------------------------------------------------------
4890 '
4900 '   --- This routine is called by above routines to
4910 '         check availability within partial bytes of
4920 '         AVAIL$...
4930 '
4940     MASK = 0
4950     FOR K = FIRST.BIT.USED TO LAST.BIT.USED
4960             MASK = MASK + 2^K
4970             IF (ASC(BYT.TO.CK$) AND 2^K) = 0 THEN AVAIL
= 0: RETURN
4980     NEXT
4990 RETURN
5000 '  ------------------------------------------------------------
5010 '
5020 '   --- This routine is called when a whole byte is to
5030 '         be set to NOT AVAILABLE state, both AVAIL
5040 '         and SET are TRUE ..
5050 '
5060     FOR J = FIRST.BYT TO LAST.BYT
5070             MID$(AVAIL$,J,1) = CHR$(0)
5080     NEXT
5090 RETURN
5100 '  ------------------------------------------------------------
5110 '
5120 'this routine checks and sets NET and NLT times
5130 '         used for checking crew rest
5140 '
5150     DAY = START.TIME\1440 + 1
5160     IF DAY < 2 OR DAY > 6 THEN C.REST = -1: RETURN
5170 '
5180     IF START.TIME >= NET(DAY) OR NET(DAY) = -1 THEN ST.C
K = -1 ELSE ST.CK = 0
5190     IF END.TIME <= NLT(DAY) OR NLT(DAY) = -1 THEN END.CK
 = -1 ELSE END.CK = 0
5200 '
5210     IF ST.CK AND END.CK THEN C.REST = -1 ELSE C.REST = 0
: RETURN
```

```
5220      '
5230      IF (START.TIME-720 < NLT(DAY-1)) OR (NLT(DAY-1) = -1
) THEN NLT(DAY-1) = START.TIME - 720
5240      IF (NLT(DAY) > START.TIME+720) OR (NLT(DAY) = -1) TH
EN NLT(DAY) = START.TIME + 720
5250      IF (NET(DAY) < END.TIME-720) OR (NET(DAY) = -1) THEN
 NET(DAY) = END.TIME - 720
5260      IF (NET(DAY+1) < END.TIME+720) OR (NET(DAY+1) = -1)
THEN NET(DAY+1) = END.TIME + 720
5270      '
5280 RETURN
```

```
100     '*** SCHED.SET ************************************
110     'program dated 25 May 1983
120     '
130     'This program builds the bare schedule file from
140     '       shellnn.dat and wknn.dat
150     '
160     'variables required:
170     '       none
180     '
190     'returns:
200     '       SCHEDnn.xxx file
210     '
220     DEFINT A-Z
230     CLR$ = CHR$(26): DOWN$ = CHR$(10): ESC$ = CHR$(27)
240     MID.SCRN$ = CLR$ + STRING$(6,10)
250     UP$ = CHR$(11): MOV.LEFT$ = CHR$(8): MOV.RIGHT$ = CH
R$(12)
260     HOME$ = CHR$(30): CLR.LINE$ = ESC$ + "T"
270     '
280     PERIOD.ST.TIME = 0: PERIOD.DUR = 10080: INCR = 30: M
AX.PIL.NUM = 60
290     DIM QUAL(MAX.PIL.NUM), AVAIL$(MAX.PIL.NUM), CUR.DT(M
AX.PIL.NUM,9)
300     DIM PILOT$(255), ACT.CUR.QUAL$(255)
310     ACT.CODE.USED$ = STRING$(32,0)
320     '
330     C$ = "Enter: 0 if correct, 1 to change it: "
340     E$ = "Error, enter 0 or 1 only, try again..."
350     '
360     PRINT MID.SCRN$ "Enter the week number:";
370     INPUT" ", WK.NUM$
380     WKDAT.FILE$ = "WK" + WK.NUM$ + ".DAT"
390     ON ERROR GOTO 410
400     OPEN "I", 1, WKDAT.FILE$
410     IF ERR = 53 THEN PRINT"No " WKDAT.FILE$ " found, can
not continue.. " ELSE CLOSE
420     ON ERROR GOTO 0
430     OPEN "R", 1, WKDAT.FILE$, 93
440     FIELD#1, 1 AS N1$, 2 AS N2$, 9 AS N3$, 81 AS N4$
450     N = MAX.PIL.NUM + 1
460     GET#1, N
470     WK.DATE = CVI(N2$): WK.DATE$ = N3$
480     CLOSE
490     '
500     SCHED.NUM = 0
510     FIL.NAM.FOUND = 0
520     WHILE NOT FIL.NAM.FOUND
530       SCHED.NUM = SCHED.NUM + 1
540       SCHED.NUM$ = MID$(STR$(SCHED.NUM),2)
550       WHILE LEN(SCHED.NUM$) < 3
560             SCHED.NUM$ = "0" + SCHED.NUM$
570       WEND
580       FILENAME$ = "SCHED" + WK.NUM$ + "." + SCHED.NUM$
590     '
600     'check if file already exists
```

```
610         ON ERROR GOTO 630
620         OPEN "I", 1, FILENAME$
630         IF ERR = 53 THEN FIL.NAM.FOUND = -1: RESUME 650 EL
SE CLOSE#1
640       'no error indicates file was found and opened, try a
gain...
650         ON ERROR GOTO 0
660       WEND
670       PRINT"Using " FILENAME$ " for schedule data, dated "
 WK.DATE$
680       PRINT: PRINT C$;: A$ = INPUT$(1): PRINT A$
690       IF A$ = "1" THEN GOTO 360 ELSE IF A$ <> "0" THEN PRI
NT E$: GOTO 670
700       '
710       '___schedule_data_____________________________________
720       '
730       OPEN "R", 1, FILENAME$, 58
740       '         seq.num: act.sched.time: act.code: pil.num:
 st.time:    end.time:   act name:    pilots:     cur.req:     qu
al.req:
750       FIELD#1, 2 AS N11$, 2 AS N12$, 1 AS N13$, 1 AS N14$,
 2 AS N15$, 2 AS N16$, 20 AS N17$, 8 AS N18$, 10 AS N19$, 10
 AS N110$
760       FIELD#1, 58 AS N1A$
770       '
780       SHELL.FILE$ = "SHELL" + WK.NUM$ + ".DAT"
790       '
800       'open shell data file as #2...
810       OPEN "R", 2, SHELL.FILE$, 30
820       '          seq.num: act.sched.time: act.code: pil.num:
  act.st time: act.end.time: act.name:
830       FIELD#2, 2 AS N21$, 2 AS N22$,    1 AS N23$, 1 AS N24
$, 2 AS N25$,     2 AS N26$,   20 AS N27$
840       FIELD#2, 30 AS N2A$
850       '
860       M = 0: N = 0: END.FIL = 0: ACT.SCHED.TIME = 0: MAX.N
 = 20
870       DIM ACT$(19)
880       '
890       'following string has bits 0 thru 59 'ON'
900       ALL.PILOT$ = STRING$(7,255) + CHR$(15)
910       '
920       'open act.def file as #3 for currency and qual
930       '         reqts...
940       OPEN "R", 3, "ACT.DEF", 46
950       FIELD#3, 2 AS N31$, 20 AS N32$, 2 AS N33$, 2 AS N34$
, 10 AS N35$, 10 AS N36$
960       '
970       PRINT"Getting shell data from " SHELL.FILE$ " and sa
ving in " FILENAME$
980       WHILE NOT END.FIL
990       'get shell records 20 at a time or until end
1000      '         found...
1010        WHILE (ACT.SCHED.TIME <> 32767) AND (N < MAX.N)
1020          N = N + 1
```

```
1030          GET#2, N
1040      'save temporarily in act$, make len equal to new
1050      '         rec len by appending null chars...
1060          ACT$(N MOD 20) = N2A$ + STRING$(58 - LEN(N2A$),0
)
1070          ACT.SCHED.TIME = CVI(N22$)
1080        WEND
1090        IF ACT.SCHED.TIME = 32767 THEN END.FIL = -1
1100      'save next 20 or all remaining act$ in schednn.xxx
1110      '         file...
1120        WHILE M < N
1130          M = M + 1
1140          ACT.CODE = ASC(MID$(ACT$(M MOD 20),5,1))
1150          GET#3, ACT.CODE
1160          CUR.REQ$ = N35$: QUAL.REQ$ = N36$
1170          ACT.CUR.QUAL$(ACT.CODE) = CUR.REQ$ + QUAL.REQ$
1180      '
1190      'save the currency and qual strings with the record
1200      '         and the act.code.used bit for each act.code
1210      '         in the schedule...
1220      '
1230          MID$(ACT$(M MOD 20),39,20) = ACT.CUR.QUAL$(ACT.C
ODE)
1240          BYTE = ACT.CODE\8 + 1: BIT = (ACT.CODE - 1) MOD
8
1250          BYT$ = MID$(ACT.CODE.USED$,BYTE,1)
1260          IF (ASC(BYT$) AND 2^BIT) <> 2^BIT THEN MID$(ACT.
CODE.USED$,BYTE,1) = CHR$(ASC(BYT$) + 2^BIT)
1270      '
1280          LSET N1A$ = ACT$(M MOD 20)
1290          PUT#1, M
1300        WEND
1310        MAX.N = MAX.N + 20
1320      WEND
1330      MAX.N = N
1340      CLOSE #2, #3
1350      ERASE ACT$
1360      PRINT"Transfer completed"
1370      '
1380      'schednn.xxx now has a record for each activity
1390      '         found in the schedule shell...
1400      '
1410      'open weekly data file as #3 and get avail$ and
1420      '         qual data in memory...
1430      PRINT"Getting AVAIL$ and QUAL data from " WKDAT.FILE
$
1440      OPEN "R", 3, WKDAT.FILE$, 93
1450      '          pil.num:    avail$:      cur.dt:      qual:
   net/nit:
1460      FIELD#3, 1 AS N31$, 42 AS N32$, 20 AS N33$, 2 AS N34
$, 28 AS N35$
1470      FIELD#3, 93 AS N3A$
1480      'open a specific weekly data file to be used with
1490      '         this schedule data...
1500      OPEN "R", 2, "WK" + WK.NUM$ + "." + SCHED.NUM$, 93
```

```
1510     FIELD#2, 93 AS N2A$
1520     '
1530     FOR P = 1 TO MAX.PIL.NUM
1540       GET#3, P
1550       IF P <> ASC(N31$) THEN PRINT"Error in " WKDAT.FILE
$ ", record" P "<> to pilot number" ASC(N31$)
1560       AVAIL$(P) = N32$
1570     '   FOR Q = 0 TO 9
1580     '     CUR.DT(P,Q) = CVI(MID$(N33$,Q*2+1,2))
1590     '   NEXT
1600       QUAL(P) = CVI(N34$)
1610     'save in individual week's data file...
1620     TMP$ = N3A$: LSET N2A$ = TMP$
1630     PUT#2, P
1640     NEXT
1650     'save final record - date data...
1660     GET#3, P
1670     TMP$ = N3A$: LSET N2A$ = TMP$
1680     PUT#2, P
1690     CLOSE #2, #3
1700     '
1710     'check each act.code (if used) then evaluate each
1720     '     pilot for qualification and save in pilot$...
1730     FOR I = 1 TO 254
1740        BYTE = I\8 + 1: BIT = (I-1) MOD 8
1750        BYT$ = MID$(ACT.CODE.USED$,BYTE,1)
1760     'set the pilot$ bits on only for qualified pilots...
1770        IF (ASC(BYT$) AND 2^BIT) = 2^BIT THEN GOSUB 2060:
 PILOT$(I) = PILOT$
1780     NEXT
1790     '
1800     'now have pilots qualified for each activity saved
1810     '         in pilot$(act.code); next, determine which
1820     '         qualified pilots are also available, then
1830     '         save with the activity record in schednn.xxx
1840     '
1850     FOR N = 1 TO MAX.N - 1
1860               PRINT"Getting AVAIL$ data for sched sequence
 number" N
1870               GET#1, N
1880               ACT.CODE = ASC(N13$)
1890               IF ACT.CODE > 128 THEN PILOT$ = PILOT$(ACT.C
ODE) ELSE PILOT$ = N18$
1900               ACT.ST.TIME = CVI(N15$): ACT.END.TIME = CVI(
N16$)
1910               FOR I = 1 TO MAX.PIL.NUM
1920                 AVAIL$ = AVAIL$(I)
1930                 BYT$ = MID$(PILOT$,I\8+1,1): BIT = (I-1) M
OD 8
1940                 IF (ASC(BYT$) AND 2^BIT) = 2^BIT THEN GOSU
B 2230
1950               NEXT
1960               LSET N18$ = PILOT$
1970               PUT#1, N
1980     NEXT
```

```
1990     PRINT"Schedule file completed": END
2000     '
2010     '___subroutines_____________________________________________
2020     '
2030     'this routine compares the qual reqd values to the
2040     '        pilot qual values and sets the pilot$ bit
2050     '        on if a qual match is found...
2060     PILOT$ = STRING$(8,0)
2070     PRINT"Checking pilot qualifications for activity cod
e" I
2080     FOR P = 1 TO MAX.PIL.NUM
2090       J = 0: QUAL.FOUND = 0
2100       WHILE QUAL.FOUND = 0 AND J < 5
2110         J = J + 1
2120         QUAL.REQ = CVI(MID$(ACT.CUR.QUAL$(I),J*2+9,2))
2130         IF (QUAL(P) AND QUAL.REQ) = QUAL.REQ THEN QUAL.F
OUND = -1
2140       WEND
2150       BYTE = P\8+1: BYT$ = MID$(PILOT$,BYTE,1): BIT = (P
-1) MOD 8
2160       IF QUAL.FOUND THEN MID$(PILOT$,BYTE,1) = CHR$(ASC(
BYT$) + 2^BIT): PRINT"Pilot" P "qual" ELSE PRINT"Pilot" P "n
ot qual"
2170     NEXT
2180     FOR H = 1 TO 8: PRINT ASC(MID$(PILOT$,H,1));: NEXT:
PRINT
2190 RETURN
2200     '
2210     'this routine checks a pilot for availability and
2220     '        turns off the pilot$ bit if not available...
2230     START.TIME = ACT.ST.TIME
2240     END.TIME = ACT.END.TIME
2250     AVAIL = -1: SET = 0
2260     GOSUB 2760
2270     PRINT"Pilot" I;
2280     IF NOT AVAIL THEN MID$(PILOT$,I\8+1,1) = CHR$(ASC(BY
T$) - 2^BIT): PRINT"Not avail" ELSE PRINT"Avail"
2290 RETURN
2300     '
2310     'trim trailing spaces...
2320     L = LEN(TRIM$) + 1: L.CHR$ = CHR$(0)
2330     WHILE ASC(L.CHR$) < 33
2340             L = L - 1
2350             L.CHR$ = MID$(TRIM$,L,1)
2360     WEND
2370     TRIM$ = LEFT$(TRIM$,L)
2380 RETURN
2390     '
2400     'dynamic array size increase...
2410     DIM TMP$(MAX.N)
2420     FOR M = 1 TO MAX.N: TMP$(M) = ACT$(M): NEXT
2430     ERASE ACT$: DIM ACT$(MAX.N + 10)
2440     FOR M = 1 TO MAX.N: ACT$(M) = TMP$(M): NEXT
2450     MAX.N = MAX.N + 10
2460     ERASE TMP$
```

```
2470     ON ERROR GOTO 0
2480     RETURN
2490     '
2500 '   ------------------------------------------------------------
2510     '
2520     '*** CASE ***
2530     'module dated 24 April 1983
2540     '
2550     'This module includes subroutines called by other
2560     '        modules in determining the case of each
2570     '        activity relative to the week
2580     '
2590     'variables rquired:
2600     '        PERIOD.ST.TIME as an integer in minutes or o
ther time units
2610     '        PERIOD.DUR as an integer length of period
2620     '        INCR as an integer for the value of each bit
 (resolution)
2630     '        START.TIME as values for the activity
2640     '        END.TIME                    "
2650     '        AVAIL$ as a bit string with '1' available, '
0' not avail
2660     '        AVAIL as a control code
2670     '        SET as a control code to set the time 'not a
vailable'
2680     '
2690     'returns:
2700     '        AVAIL as TRUE if time is available
2710     '        AVAIL$ updated if AVAIL and SET both TRUE
2720     '
2730     'subroutines used:
2740     '        all internal
2750     '
2760     GOSUB 2980
2770     GOSUB 3190
2780     RETURN
2790     '   ------------------------------------------------------
2800 '
2810 '   --- This routine determines the case of activity
2820     '        start (CASE1) and end (CASE2) relative to
2830     '        the period start and end...
2840 '
2850 '           CASE1 and CASE2 equal 1 if times are before
2860     '        the period starts, 2 if during the period,
2870     '        or 3 if after the period.  Thus if CASE1 is
2880     '        3 or CASE2 is 1, the whole activity falls
2890     '        outside the period in question.  If both
2900     '        CASE1 and CASE2 are 2, then the whole
2910     '        activity is within the period.
2920 '
2930 '           CASE3 has a value of 1 if the whole
2940     '        activity falls on a single byte, 2 if on
2950     '        adjacent bytes  and 3 if one or more whole
2960     '        bytes 'all bet' sen the start and end
2970 '
```

```
2980     START.BIT = START.TIME\INCR
2990     START.BYTE = START.BIT\8 + 1
3000     END.BIT = (END.TIME-1)\INCR
3010     END.BYTE = END.BIT\8 + 1
3020     IF START.TIME >= PERIOD.ST.TIME THEN COND1 = -1 ELSE
 COND1 = 0
3030     IF START.TIME < (PERIOD.ST.TIME + PERIOD.DUR) THEN C
OND2 = -1 ELSE COND2 = 0
3040     IF COND1 AND COND2 THEN CASE1 = 2 ELSE IF NOT COND1
THEN CASE1 = 1 ELSE IF NOT COND2 THEN CASE1 = 3
3050     IF END.TIME > PERIOD.ST.TIME THEN COND3 = -1 ELSE CO
ND3 = 0
3060     IF END.TIME <= (PERIOD.ST.TIME+PERIOD.DUR) THEN COND
4 = -1 ELSE COND4 = 0
3070     IF COND3 AND COND4 THEN CASE2 = 2 ELSE IF NOT COND3
THEN CASE2 = 1 ELSE IF NOT COND4 THEN CASE2 = 3
3080     IF END.BYTE = START.BYTE THEN CASE3 = 1
3090     IF END.BYTE - START.BYTE = 1 THEN CASE3 = 2
3100     IF END.BYTE - START.BYTE > 1 THEN CASE3 = 3
3110 RETURN
3120 '  ------------------------------------------------------
3130 '
3140 '  This routine selects the proper routine for
3150     '        checking or setting availability based on
3160     '        the case defined by CASE1, CASE2, and CASE3
3170 '
3180 '           if start is before period...
3190     IF CASE1=1 AND CASE2=2 THEN ON CASE3 GOSUB 3340,3440
,3440
3200 '           if start and end are during period...
3210     IF CASE1=2 AND CASE2=2 THEN ON CASE3 GOSUB 3570,3740
,3700
3220 '           if start is during period but end is after..
.
3230     IF CASE1=2 AND CASE2=3 THEN ON CASE3 GOSUB 3920,4050
,4050
3240 '           if start is before and end is after period..
.
3250     IF CASE1=1 AND CASE2=3 THEN FIRST.BYT=1: LAST.BYT=LE
N(AVAIL$): GOSUB 4090
3260 '           the final case ends before or starts after p
eriod...
3270     IF CASE1=3 OR CASE2=1 THEN PRINT"Activity is complet
ely outside the period.. "
3280 RETURN
3290 '  ------------------------------------------------------
3300 '
3310 '  --- This routine is used when END.BYTE$ is the
3320     '        first byte of AVAIL$..
3330 '
3340     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
3350     BYT.TO.CK$ = LEFT$(AVAIL$,1)
3360     GOSUB 4310
3370     IF AVAIL AND SET THEN MID$(AVAIL$,1,1) = CHR$(ASC(BY
T.TO.CK$) AND (NOT MASK))
```

```
3380 RETURN
3390 '  ------------------------------------------------------------
3400 '
3410 '   --- This routine is used when END BYTE points to
3420 '         end byte...
3430 '
3440     FIRST.BYT = 1: LAST.BYT =  END.BYTE-1
3450     GOSUB 4190
3460     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
3470     BYT.TO.CK$ = MID$(AVAIL$,END.BYTE,1): J = END.BYTE
3480     GOSUB 4310
3490     IF AVAIL AND SET THEN GOSUB 4430 ELSE RETURN
3500     MID$(AVAIL$,END.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND (
NOT MASK))
3510 RETURN
3520 '  ------------------------------------------------------------
3530 '
3540 '  --- This routine is used for the single byte case
3550 '       where one byte includes both start and end...
3560 '
3570     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
3580     MASK = 0
3590     FIRST.BIT.USED = (START.BIT MOD 8)
3600     LAST.BIT.USED = (END.BIT MOD 8)
3610     GOSUB 4310
3620     IF AVAIL AND SET THEN MID$(AVAIL$,START.BYTE,1) = CH
R$(ASC(BYT.TO.CK$) AND (NOT MASK))
3630 RETURN
3640 '  ------------------------------------------------------------
3650 '
3660 '   --- This routine is used when one or more bytes
3670 '         separate the first and last bytes or when
3680 '         they are adjacent...
3690 '
3700     FIRST.BYT = START.BYTE+1: LAST.BYT = END.BYTE-1
3710     GOSUB 4190
3720     IF NOT AVAIL THEN RETURN
3730 '            CASE3 = 2 enters here...
3740     FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
7
3750     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
3760     GOSUB 4310
3770     IF AVAIL AND SET THEN MASK.ST=MASK: BYT.ST$=BYT.TO.C
K$ ELSE  IF NOT AVAIL THEN RETURN
3780     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
3790     BYT.TO.CK$ = MID$(AVAIL$,END.BYTE,1): J = END.BYTE
3800     GOSUB 4310
3810     IF NOT AVAIL THEN RETURN
3820     IF (CASE3=3) AND (AVAIL AND SET) THEN GOSUB 4430
3830     IF NOT(AVAIL AND SET) THEN RETURN
3840     MID$(AVAIL$,START.BYTE,1) = CHR$(ASC(BYT.ST$) AND (N
OT MASK.ST))
3850     MID$(AVAIL$,END.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND (
NOT MASK))
3860 RETURN
```

```
3870 '  ------------------------------------------------------------
3880 '
3890 '    --- This routine is used when the last byte in the
3900 '          string is the only byte to be checked...
3910 '
3920      BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
3930      FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
(PERIOD.END.BIT MOD 8)
3940      GOSUB 4310
3950      IF AVAIL AND SET THEN MID$(AVAIL$,START.BYTE,1) = CH
R$(ASC(BYT.TO.CK$) AND (NOT MASK))
3960 RETURN
3970 '  ------------------------------------------------------------
3980 '
3990 '    --- This routine is used when the activity ends
4000 '          after the period and the first byte is one
4010 '          or more bytes from the end of AVAIL$.  The
4020 '          last two cases of CASE3 are both checked by
4030 '          this routine...
4040 '
4050      FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
7
4060      BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
4070      GOSUB 4310
4080      FIRST.BYT = START.BYTE+1: LAST.BYT = LEN(AVAIL$)
4090      GOSUB 4190
4100      IF AVAIL AND SET THEN GOSUB 4430 ELSE RETURN
4110      MID$(AVAIL$,START.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND
 (NOT MASK))
4120 RETURN
4130 '  ------------------------------------------------------------
4140 '
4150 '    --- This routine is used by the routines above when
4160 '          whole bytes are being checked for
4170 '          availability...
4180 '
4190      FOR J = FIRST.BYT TO LAST.BYT
4200                BYT.TO.CK$ = MID$(AVAIL$,J,1)
4210                IF BYT.TO.CK$ <> CHR$(255) THEN FIRST.BIT.US
ED=0: LAST.BIT.USED=7: GOSUB 4310
4220                IF NOT AVAIL THEN RETURN
4230      NEXT
4240 RETURN
4250 '  ------------------------------------------------------------
4260 '
4270 '    --- This routine is called by above routines to
4280 '          check availability within partial bytes of
4290 '          AVAIL$...
4300 '
4310      MASK = 0
4320      FOR K = FIRST.BIT.USED TO LAST.BIT.USED
4330                MASK = MASK + 2^K
4340                IF (ASC(BYT.TO.CK$) AND 2^K) = 0 THEN AVAIL
= 0: RETURN
4350      NEXT
```

```
4360 RETURN
4370 '  ------------------------------------------------------------
4380 '
4390 '   --- This routine is called when a whole byte is to
4400 '          be set to NOT AVAILABLE state, both AVAIL
4410 '          and SET are TRUE...
4420 '
4430     FOR J = FIRST.BYT TO LAST.BYT
4440             MID$(AVAIL$,J,1) = CHR$(0)
4450     NEXT
4460 RETURN
4470 '  ------------------------------------------------------------
```

```
100       '*** WKSCHED.SET ***********************************
110       'program dated 24 May 1983
120       '
130       'This program builds the final schedule file from
140       '         schednn.xxx and wknn.xxx
150       '
160       'variables required:
170       '         none
180       '
190       'returns:
200       '         SCHEDnn.DAT file when completed
210       '
220       DEFINT A-Z
230       CLR$ = CHR$(26): DOWN$ = CHR$(10): ESC$ = CHR$(27):
CR$ = CHR$(13)
240       MID.SCRN$ = CLR$ + STRING$(6,10)
250       UP$ = CHR$(11): MOV.LEFT$ = CHR$(8): MOV.RIGHT$ = CH
R$(12)
260       HOME$ = CHR$(30): CLR.LINE$ = ESC$ + "T"
270       '
280       PERIOD.ST.TIME = 0: PERIOD.DUR = 10080: INCR = 30: M
AX.PIL.NUM = 60
290       DIM QUAL(MAX.PIL.NUM), AVAIL$(MAX.PIL.NUM), PIL.NAM$
(MAX.PIL.NUM + 1)
300       DIM PILOT$(254), CUR.NAM$(15), EXP.DUR(15), INXP.DUR
(15), EVENT.NUM(15)
310       DIM NET(7), NLT(7)
320       ACT.CODE.USED$ = STRING$(16,0)
330       DAY$ = "SunMonTueWedThuFriSat"
340       MONTH$      = "JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDECJA
N"
350       FIRST.DAY$ = "00103206009112115218221324427430533536
6"
360       '
370       C$ = "Enter: 0 if correct, 1 to change it: "
380       E$ = "Error, enter 0 or 1 only, try again..."
390       '
400       PRINT MID.SCRN$ "Enter the week number:";: INPUT" ",
 WK.NUM$
410       FILENAME$ = "SCHED" + WK.NUM$ + ".*"
420       PRINT"Schedule files for week " WK.NUM$ ":": PRINT
430       FILES FILENAME$: PRINT DOWN$
440       PRINT"Enter the schedule file number or 0 to start a
gain:";: INPUT" ", SCHED.NUM$
450       IF SCHED.NUM$ = "0" THEN GOTO 400
460       WHILE LEN(SCHED.NUM$) < 3
470         SCHED.NUM$ = "0" + SCHED.NUM$
480       WEND
490       FILENAME$ = "SCHED" + WK.NUM$ + "." + SCHED.NUM$
500       '
510       PRINT MID.SCRN$ "Using " FILENAME$ " for schedule da
ta."
520       PRINT C$;: A$ = INPUT$(1): PRINT A$
530       IF A$ = "1" THEN GOTO 400 ELSE IF A$ <> "0" THEN PRI
NT E$: GOTO 520
```

```
540       '
550       '___schedule_data_____________________________________________
560       '
570       OPEN "R", 1, FILENAME$, 58
580       '          seq.num: act.sched.time: act.code: pil.num:
 st.time:    end.time:  act.name:    pilots:     cur req:     qu
al.req:
590       FIELD#1, 2 AS N11$, 2 AS N12$, 1 AS N13$, 1 AS N14$,
 2 AS N15$, 2 AS N16$, 20 AS N17$, 8 AS N18$, 10 AS N19$, 10
 AS N110$
600       FIELD#1, 58 AS N1A$
610       '
620       PRINT MID.SCRN$ "Getting date data.. "
630       WKDAT.FILE$ = "WK" + WK.NUM$ + "." + SCHED.NUM$
640       OPEN "R", 2, WKDAT.FILE$, 93
650       FIELD#2, 1 AS N21$, 2 AS N22$, 9 AS N23$, 81 AS N24$
660       GET#2, MAX.PIL.NUM + 1
670       IF ASC(N21$) <> MAX.PIL.NUM + 1 THEN PRINT"File acce
ss error in " WKDAT.FILE$
680       WK.DATE = CVI(N22$): WK.DATE$ = N23$
690       IF (WK.DATE MOD 1000)\7 <> VAL(WK.NUM$) THEN PRINT"E
rror: week number " WK.NUM$ " does not agree with file " WKD
AT.FILE$ ",
dated " WK.DATE$
700       CLOSE #2
710       '
720       PRINT MID.SCRN$ "Getting currency names from file...
"
730       OPEN "R", 2, "CUR.DEF", 28
740       '          cur.num:   cur.nam$:    exp.dur:    inxp.dur:
  event.num:
750       FIELD#2, 2 AS N21$, 20 AS N22$, 2 AS N23$, 2 AS N24$
, 2 AS N25$
760       FOR I = 1 TO 15
770                 GET#2, I
780                 TRIM$ = N22$: GOSUB 3510: CUR.NAM$(I) = TRIM
$
790                 EXP.DUR(I) = CVI(N23$)
800                 INXP.DUR(I) = CVI(N24$)
810                 EVENT.NUM(I) = CVI(N25$)
820       NEXT
830       CLOSE #2
840       '
850       PRINT MID.SCRN$ "Getting pilot names from file..."
860       OPEN "R", 2, "PILNAM.DEF", 27
870       '          pil.num:    l.name$:     init$:      rank$:
880       FIELD#2, 2 AS N21$, 20 AS N22$, 2 AS N23$, 3 AS N24$
890       FOR I = 1 TO MAX.PIL.NUM
900                 GET#2, I
910                 TRIM$ = N22$
920                 IF TRIM$ = "Not in use           " THEN GOTO
950 ELSE GOSUB 3510: PIL.NAM$(I) = TRIM$
930                 PIL.NAM$(I) = N24$ + " " + PIL.NAM$(I) + ",
" + N23$
940                 PRINT CR$ STRING$(33,32) CR$ USING "##"; I;
```

```
PRINT " - " FIL.NAM$(I);
950      NEXT
960      FIL.NAM$(MAX.FIL.NUM+1) = "None"
970      CLOSE #2
980      '
990      N = 0: ACT.SCHED.TIME = 0
1000     PRINT MID.SCRN$ "Getting length of " FILENAME$
1010     WHILE ACT.SCHED.TIME <> 32767
1020          N = N + 1
1030          GET#1, N
1040          ACT.SCHED.TIME = CVI(N12$)
1050     WEND
1060     MAX.N = N: DIM ACT$(MAX.N)
1070     PRINT"Reading " FILENAME$ " into memory"
1080     FOR N = 1 TO MAX.N
1090          GET#1, N
1100          ACT$(N) = N1A$
1110     NEXT
1120     '
1130     PRINT MID.SCRN$ FILENAME$ " data now in memory..."
1140     '
1150     'open data file...
1160     OPEN "R", 2, WKDAT.FILE$, 93
1170     FIELD#2, 1 AS N221$, 42 AS N222$, 20 AS N223$, 2 AS
N224$, 28 AS N225$
1180     '
1190     PRINT
1200     PRINT"  Enter:"
1210     PRINT"           0 to quit"
1220     PRINT"           1 to fill schedule in sequence numbe
r order"
1230     PRINT"           2 to fill individual sequence number
 activities"
1240     PRINT"           3 to fill by activity number"
1250     PRINT"  Which choice? ";
1260     SEL = VAL(INPUT$(1))
1270     IF SEL = 0 THEN GOTO 1310 ELSE IF SEL > 3 THEN PRINT
"Error, enter 0 to 3 only, try again...": GOTO 1250
1280     ON SEL GOSUB 1400, 1430, 1500
1290     PRINT MID.SCRN$: GOTO 1190
1300     '
1310     FOR N = 1 TO MAX.N
1320               LSET N1A$ = ACT$(N)
1330               PUT#1, N
1340     NEXT
1350     PRINT MID.SCRN$ "Schedule data saved in " FILENAME$
" and " WKDAT.FILE$
1360     '
1370     '___control_subroutines_____________________________
1380     '
1390     'step thru in sequence number order...
1400     PRINT"Not written yet...";: DUMMY$ = INPUT$(1)
1410 RETURN
1420     'one seq num at a time from keyboard...
1430     PRINT MID.SCRN$ "What is the sequence number?";
```

```
1440     INPUT" ", SEQ.NUM
1450     IF SEQ.NUM <= 0 THEN GOTO 1480 ELSE IF SEQ.NUM > MAX
.N THEN PRINT"Error: sequence number too big, enter a number
 from 0 (to
quit) to" MAX.N: PRINT"Try again:"; : INPUT" ", SEQ.NUM: GOTO
 1450
1460     GOSUB 1560
1470     PRINT"Enter 0 to quit, sequence number to display an
other schedule activity:": GOTO 1440
1480 RETURN
1490     'by activity number...
1500     PRINT"Not written yet...";: DUMMY$ = INPUT$(1)
1510 RETURN
1520     '
1530     '___subroutines_____________________________________
1540     '
1550     'display an activity and candidates on screen...
1560     IF SEQ.NUM <> CVI(MID$(ACT$(SEQ.NUM),1,2)) THEN PRIN
T"Error in file at record " SEQ.NUM
1570     ACT.SCHED.TIME = CVI(MID$(ACT$(SEQ.NUM),3,2))
1580     'get clock time, day, and date...
1590     GOSUB 3730: SCHED.TIME$ = THIS.TIME$
1600     GOSUB 3880
1610     ACT.CODE = ASC(MID$(ACT$(SEQ.NUM),5,1))
1620     PIL.NUM = ASC(MID$(ACT$(SEQ.NUM),6,1))
1630     START.TIME = CVI(MID$(ACT$(SEQ.NUM),7,2))
1640     GOSUB 3730: ST.TIME$ = THIS.TIME$
1650     END.TIME = CVI(MID$(ACT$(SEQ.NUM),9,2))
1660     GOSUB 3730: END.TIME$ = THIS.TIME$
1670     IF PIL.NUM = 255 THEN PIL.NUM = MAX.PIL.NUM + 1
1680     ACT.NAME$ = MID$(ACT$(SEQ.NUM),11,20)
1690     CAND$ = MID$(ACT$(SEQ.NUM),31,8)
1700     CAND.TOT = 0
1710     FOR I = 1 TO MAX.PIL.NUM
1720              BYTE = ASC(MID$(CAND$,I\8+1,1)): BIT = (I-1)
 MOD 8
1730              IF (BYTE AND 2^BIT) = 2^BIT THEN CAND.TOT =
CAND.TOT + 1
1740     NEXT
1750     CUR.REQ = CVI(MID$(ACT$(SEQ.NUM),39,2))
1760     '
1770     PRINT LEFT$(MID.SCRN$,5);
1780     PRINT"Sequence number:" SEQ.NUM TAB(50) THIS.DAY$ ",
 " THIS.DATE$ DOWN$
1790     PRINT SCHED.TIME$ " - " ACT.NAME$ TAB(35) "Assigned:
 " PIL.NAM$(PIL.NUM) DOWN$
1800     NONE = -1
1810     PRINT"Currencies required:"
1820     FOR I = 0 TO 14
1830         IF (CUR.REQ AND 2^I) = 2^I THEN PRINT CUR.NAM$(I
+1) " ";: IF NONE THEN NONE = 0
1840     NEXT
1850     IF NONE THEN PRINT"None"
1860     PRINT
1870     PRINT"Candidate names "
```

```
1880     IF CAND.TOT = 0 THEN PRINT"None shown as both qualif
ied and available": GOTO 2170
1890     K = 0: L = CAND.TOT\3
1900     IF CAND.TOT MOD 3 > 0 THEN L1 = L + 1 ELSE L1 = L
1910     IF CAND.TOT MOD 3 > 1 THEN L2 = L + 1 ELSE L2 = L
1920     BYTE = 0: BIT = 0: LN = 0
1930     WHILE LN < L1
1940              LN = LN + 1
1950              I = 0
1960     'find first column name to print...
1970              FOR J = 1 TO LN
1980                       GOSUB 3290
1990              NEXT
2000     'print it...
2010              GOSUB 3370: IF K = CAND.TOT THEN GOTO 2140
2020     'skip l1 names
2030              FOR J = 1 TO L1
2040                       GOSUB 3290
2050              NEXT
2060     'print the next one
2070              GOSUB 3370: IF K = CAND.TOT THEN GOTO 2140
2080     'skip l2 names
2090              FOR J =1 TO L2
2100                       GOSUB 3290
2110              NEXT
2120     '
2130              GOSUB 3370
2140     WEND
2150     '
2160     'screen now shows activity and available pilots...
2170     PRINT"Enter 0 to skip selection or pilot number to s
elect a pilot for this activity"
2180     INPUT"Which pilot number? ", I
2190     IF I <= 0 THEN GOTO 3060 ELSE IF I > MAX.PIL.NUM THE
N PRINT"Out of range, enter a number from 0 to" MAX.PIL.NUM
"only, try a
gain": GOTO 2180
2200     'check avail and crew rest if applicable...
2210     GET#2, I
2220     IF I <> ASC(N221$) THEN PRINT"File access error in "
 WKDAT.FILE$
2230     AVAIL$ = N222$
2240     NET.NLT$ = N225$
2250     FOR N = 1 TO 7
2260              NET(N) = CVI(MID$(NET.NLT$,N*4 - 3,2))
2270              NLT(N) = CVI(MID$(NET.NLT$,N*4 - 1,2))
2280     NEXT
2290     AVAIL = -1: SET = 0
2300     PRINT"Recheck availability of " PIL.NAM$(I);
2310     GOSUB 4300
2320     IF NOT AVAIL THEN PRINT" is not good, resetting stat
us...": MID$(ACT$(SEQ.NUM),I\8+31,1) = CHR$(ASC(MID$(CAND$,I
\8+1,1)) - 2
^((I-1) MOD 8)): GOTO 1560
2330     IF AVAIL AND (ACT.CODE AND 192) THEN GOSUB 3110 ELSE
```

```
 C.REST = -1
2340     IF C.REST AND AVAIL THEN PRINT" is good" ELSE PRINT"
 is not good"
2350     IF AVAIL AND (NOT C.REST) THEN PRINT"Crew rest rules
 not met, enter 0 to ignore crew rest or 1 to NOT select thi
s pilot ";:
A$ = INPUT$(1): PRINT A$ ELSE GOTO 2380
2360     IF A$ = "1" THEN GOTO 1770 ELSE IF A$ <> "0" THEN PR
INT E$: GOTO 2350
2370     'avail and crew rest check good so set this pilot in
 this activity...
2380     SET = -1: GOSUB 4730
2390     BYTE = ASC(MID$(CAND$,I\8+1,1)): BIT = (I-1) MOD 8
2400     IF (BYTE AND 2^BIT) = 2^BIT THEN MID$(CAND$,I\8+1,1)
 = CHR$(BYTE - 2^BIT)
2410     LSET N222$ = AVAIL$
2420     FOR N = 1 TO 7
2430              IF NET(N) <> -1 THEN MID$(NET.NLT$,N*4 - 3,2
) = MKI$(NET(N))
2440              IF NLT(N) <> -1 THEN MID$(NET.NLT$,N*4 - 1,2
) = MKI$(NLT(N))
2450     NEXT
2460     LSET N225$ = NET.NLT$
2470     PUT#2, I
2480     'update act$(seq.num) in memory...
2490     MID$(ACT$(SEQ.NUM),6,1) = CHR$(I)
2500     MID$(ACT$(SEQ.NUM),31,8) = CAND$
2510     FOR J = 1 TO MAX.N
2520              IF J = SEQ.NUM THEN GOTO 2570
2530              IF END.TIME < CVI(MID$(ACT$(J),7,2)) THEN GO
TO 2570
2540              IF START.TIME > CVI(MID$(ACT$(J),9,2)) THEN
GOTO 2570
2550              B = ASC(MID$(ACT$(J),I\8+31,1))
2560              IF B AND 2^((I-1) MOD 8) THEN MID$(ACT$(J),I
\8+31,1) = CHR$(B - 2^((I-1) MOD 8))
2570     NEXT
2580     IF PIL.NUM = MAX.PIL.NUM + 1 THEN GOTO 1560
2590     'if pil.num <> 61 then reset old pilot$ bit and avai
l$(pil.num)...
2600     GET#2, PIL.NUM
2610     AVAIL$ = N222$
2620     NET.NLT$ = N225$
2630     FOR N = 1 TO 7
2640              NET(N) = CVI(MID$(NET.NLT$,N*4 - 3,2))
2650              NLT(N) = CVI(MID$(NET.NLT$,N*4 - 1,2))
2660     NEXT
2670     BYTE = ASC(MID$(CAND$,PIL.NUM\8+1,1)): BIT = (PIL.NU
M-1) MOD 8
2680     IF (BYTE AND 2^BIT) = 0 THEN MID$(CAND$,PIL.NUM\8+1,
1) = CHR$(BYTE + 2^BIT)
2690     FOR I = START.BIT TO END.BIT
2700              BYTE = I\8+1: BIT = (I-1) MOD 8
2710              BYT$ = MID$(AVAIL$,BYTE,1)
2720              IF (ASC(BYT$) AND 2^BIT) = 0 THEN MID$(AVAIL
```

```
$,BYTE,1) = CHR$(ASC(BYT$) + 2^BIT)
2730     NEXT
2740     DAY = START.TIME\1440 + 1
2750     IF DAY < 2 OR DAY > 7 THEN GOTO 2960
2760     IF NLT(DAY-1) <> START.TIME - 720 THEN GOTO 2810
2770     ACT.SCHED.TIME = NLT(DAY-1): GOSUB 3730
2780     PRINT"Cancelled activity set crew rest time for endi
ng previous day: " THIS.TIME$
2790     PRINT C$;: A$ = INPUT$(1): PRINT A$
2800     IF A$ = "1" THEN GOSUB 3410: NLT(DAY-1) = NEW.T + (D
AY - 2)*1440 ELSE IF A$ <> "0" THEN PRINT E$: GOTO 2790
2810     IF NLT(DAY) <> START.TIME + 720 THEN GOTO 2860
2820     ACT.SCHED.TIME = NLT(DAY): GOSUB 3730
2830     PRINT"Cancelled activity set crew rest time for endi
ng this day: " THIS.TIME$
2840     PRINT C$;: A$ = INPUT$(1): PRINT A$
2850     IF A$ = "1" THEN GOSUB 3410: NLT(DAY) = NEW.T + (DAY
 - 1)*1440 ELSE IF A$ <> "0" THEN PRINT E$: GOTO 2840
2860     IF NET(DAY) <> END.TIME - 720 THEN GOTO 2910
2870     ACT.SCHED.TIME = NET(DAY): GOSUB 3730
2880     PRINT"Cancelled activity set crew rest time for begi
nning this day: " THIS.TIME$
2890     PRINT C$;: A$ = INPUT$(1): PRINT A$
2900     IF A$ = "1" THEN GOSUB 3410: NET(DAY) = NEW.T + (DAY
 - 1)*1440 ELSE IF A$ <> "0" THEN PRINT E$: GOTO 2890
2910     IF NET(DAY+1) <> END.TIME + 720 THEN GOTO 2960
2920     ACT.SCHED.TIME = NET(DAY+1): GOSUB 3730
2930     PRINT"Cancelled activity set crew rest time for begi
nning following day: " THIS.TIME$
2940     PRINT C$;: A$ = INPUT$(1): PRINT A$
2950     IF A$ = "1" THEN GOSUB 3410: NET(DAY+1) = NEW.T + DA
Y*1440 ELSE IF A$ <> "0" THEN PRINT E$: GOTO 2940
2960     PRINT PIL.NAM$(PIL.NUM) " is reset in " WKDAT.FILE$
2970     LSET N222$ = AVAIL$
2980     FOR N = 1 TO 7
2990          IF NET(N) <> -1 THEN MID$(NET.NLT$,N*4 - 3,2
) = MKI$(NET(N))
3000          IF NLT(N) <> -1 THEN MID$(NET.NLT$,N*4 - 1,2
) = MKI$(NLT(N))
3010     NEXT
3020     LSET N225$ = NET.NLT$
3030     PUT#2, PIL.NUM
3040     MID$(ACT$(SEQ.NUM),31,8) = CAND$
3050     GOTO 1560
3060 RETURN
3070     '
3080     '___internal_subroutines___
3090     '
3100     'crew rest check...
3110     'this routine checks and sets NET and NLT times used
 for checking
3120     '          crew rest...
3130     '
3140     DAY = START.TIME\1440 + 1
3150     IF DAY < 2 OR DAY > 6 THEN C.REST = -1: RETURN
```

```
3160      '
3170      IF START.TIME >= NET(DAY) OR NET(DAY) = -1 THEN ST.C
K = -1 ELSE ST.CK = 0
3180      IF END.TIME <= NLT(DAY) OR NLT(DAY) = -1 THEN END.CK
 = -1 ELSE END.CK = 0
3190      '
3200      IF ST.CK AND END.CK THEN C.REST = -1 ELSE C.REST = 0
: RETURN
3210      '
3220      IF (START.TIME-720 < NLT(DAY-1)) OR (NLT(DAY-1) = -1
) THEN NLT(DAY-1) = START.TIME - 720
3230      IF (NLT(DAY) > START.TIME+720) OR (NLT(DAY) = -1) TH
EN NLT(DAY) = START.TIME + 720
3240      IF (NET(DAY) < END.TIME-720) OR (NET(DAY) = -1) THEN
 NET(DAY) = END.TIME - 720
3250      IF (NET(DAY+1) < END.TIME+720) OR (NET(DAY+1) = -1)
THEN NET(DAY+1) = END.TIME + 720
3260      '
3270  RETURN
3280      '
3290      IF I < MAX.PIL.NUM THEN I = I + 1 ELSE GOTO 3350
3300      BYTE = ASC(MID$(CAND$,I\8+1,1)): BIT = (I-1) MOD 8
3310      WHILE ((BYTE AND 2^BIT) <> 2^BIT) AND (I < MAX.PIL.N
UM)
3320                I = I + 1
3330                BYTE = ASC(MID$(CAND$,I\8+1,1)): BIT = (I-1)
 MOD 8
3340      WEND
3350      RETURN
3360      '
3370      PRINT TAB((K*25+1) MOD 75) USING "##"; I;: PRINT " -
 " PIL.NAM$(I);: K = K + 1: IF K MOD 3 = 0 THEN PRINT
3380      RETURN
3390      '------------------------------------------------------------
3400      '
3410      PRINT"Enter the new crew rest time:";
3420      INPUT" ", NEW.T
3430      HR = NEW.T\100: MIN = NEW.T MOD 100: BAD = 0
3440      IF HR < 0 OR HR > 24 THEN BAD = -1
3450      IF MIN < 0 OR MIN > 59 THEN BAD = -1
3460      IF BAD THEN PRINT"Time not understood, re-enter as a
 4 digit number": GOTO 3410
3470      NEW.T = HR*60 + MIN
3480  RETURN
3490      '
3500      'trim trailing spaces...
3510      L = LEN(TRIM$) + 1: L.CHR$ = CHR$(0)
3520      WHILE ASC(L.CHR$) < 33
3530                L = L - 1
3540                L.CHR$ = MID$(TRIM$,L,1)
3550      WEND
3560      TRIM$ = LEFT$(TRIM$,L)
3570  RETURN
3580      '
3590      'dynamic array size increase...
```

```
3600     DIM TMP$(MAX.N)
3610     FOR M = 1 TO MAX.N: TMP$(M) = ACT$(M): NEXT
3620     ERASE ACT$: DIM ACT$(MAX.N + 10)
3630     FOR M = 1 TO MAX.N: ACT$(M) = TMP$(M): NEXT
3640     MAX.N = MAX.N + 10
3650     ERASE TMP$
3660     ON ERROR GOTO 0
3670     RETURN
3680     '
3690 '  ------------------------------------------------------------
3700     '
3710     'this routine computes the time from a time in
3720     '        minutes of a week...
3730     HR = (ACT.SCHED.TIME MOD 1440)\60
3740     MIN = (ACT.SCHED.TIME MOD 1440) MOD 60
3750     T$ = MID$(STR$(HR),2): GOSUB 3790: HR$ = T$
3760     T$ = MID$(STR$(MIN),2): GOSUB 3790: MIN$ = T$
3770     THIS.TIME$ = HR$ + MIN$
3780 RETURN
3790     WHILE LEN(T$) < 2
3800         T$ = "0" + T$
3810     WEND
3820     RETURN
3830     '  ------------------------------------------------------------
3840     '
3850     'this routine determines the day and date of an
3860     '        activity from wk.date, wk.date$, and the
3870     '        activity schedule time...
3880     DAY = ACT.SCHED.TIME\1440: THIS.DAY$ = MID$(DAY$,DAY
*3 + 1,3)
3890     THIS.DATE.J = WK.DATE + DAY: DAY.J = THIS.DATE.J MOD
 1000
3900     YEAR = VAL(RIGHT$(WK.DATE$,2)): IF YEAR/4 = YEAR\4 T
HEN L.YR = -1 ELSE L.YR = 0
3910     MO = 0: NEXT.MO.1ST.DAY = 1
3920     WHILE (DAY.J > NEXT.MO.1ST.DAY) AND (MO < 12)
3930     'save new 'this month', get next month...
3940             THIS.MO.1ST.DAY = NEXT.MO.1ST DAY
3950             MO = MO + 1
3960             NEXT.MO.1ST.DAY = VAL(MID$(FIRST.DAY$,MO*3 +
 1,3))
3970             IF (MO >= 2) AND L.YR THEN NEXT.MO.1ST.DAY =
 NEXT.MO.1ST.DAY + 1
3980     WEND
3990     'when the day falls in the following year, loop is
4000     '        terminated by mo = 12, thus...
4010     IF DAY.J >= NEXT.MO.1ST.DAY THEN YEAR = YEAR + 1: TH
IS.DATE = DAY.J - NEXT.MO.1ST.DAY + 1 ELSE THIS.DATE = DAY.J
 - THIS.MO.1
ST.DAY + 1
4020     THIS.DATE$ = MID$(STR$(THIS.DATE),2) + " " + MID$(MO
NTH$,(MO-1)*3 + 1,3) + STR$(YEAR)
4030 RETURN
4040     '  ------------------------------------------------------------
4050     '
```

```
4060     '*** CASE ***
4070     'module dated 24 April 1983
4080     '
4090     'This module includes subroutines called by other
4100     '        modules in determining the case of each
4110     '        activity relative to the week
4120     '
4130     'variables rquired:
4140     '        PERIOD.ST.TIME as an integer in minutes or o
ther time units
4150     '        PERIOD.DUR as an integer length of period
4160     '        INCR as an integer for the value of each bit
 (resolution)
4170     '        START.TIME as values for the activity
4180     '        END.TIME                "
4190     '        AVAIL$ as a bit string with '1' available, '
0' not avail
4200     '        AVAIL as a control code
4210     '        SET as a control code to set the time 'not a
vailable'
4220     '
4230     'returns:
4240     '        AVAIL as TRUE if time is available
4250     '        AVAIL$ updated if AVAIL and SET both TRUE
4260     '
4270     'subroutines used:
4280     '        all internal
4290     '
4300     GOSUB 4520
4310     GOSUB 4730
4320     RETURN
4330     '-------------------------------------------------
4340 '
4350 '   --- This routine determines the case of activity
4360     '        start (CASE1) and end (CASE2) relative to
4370     '        the period start and end...
4380 '
4390 '           CASE1 and CASE2 equal 1 if times are before
4400     '        the period starts, 2 if during the period,
4410     '        or 3 if after the period.  Thus if CASE1 is
4420     '        3 or CASE2 is 1, the whole activity falls
4430     '        outside the period in question.  If both
4440     '        CASE1 and CASE2 are 2, then the whole
4450     '        activity is within the period.
4460 '
4470 '           CASE3 has a value of 1 if the whole
4480     '        activity falls on a single byte, 2 if on
4490     '        adjacent bytes, and 3 if one or more whole
4500     '        bytes fall between the start and end.
4510 '
4520     START.BIT = START.TIME\INCR
4530     START.BYTE = START.BIT\8 + 1
4540     END.BIT = (END.TIME-1)\INCR
4550     END.BYTE =.END.BIT\8 + 1
4560     IF START.TIME >= PERIOD.ST.TIME THEN COND1 = -1 ELSE
```

```
 COND1 = 0
4570     IF START.TIME < (PERIOD.ST.TIME + PERIOD.DUR) THEN C
OND2 = -1 ELSE COND2 = 0
4580     IF COND1 AND COND2 THEN CASE1 = 2 ELSE IF NOT COND1
THEN CASE1 = 1 ELSE IF NOT COND2 THEN CASE1 = 3
4590     IF END.TIME > PERIOD.ST.TIME THEN COND3 = -1 ELSE CO
ND3 = 0
4600     IF END.TIME <= (PERIOD.ST.TIME+PERIOD.DUR) THEN COND
4 = -1 ELSE COND4 = 0
4610     IF COND3 AND COND4 THEN CASE2 = 2 ELSE IF NOT COND3
THEN CASE2 = 1 ELSE IF NOT COND4 THEN CASE2 = 3
4620     IF END.BYTE = START.BYTE THEN CASE3 = 1
4630     IF END.BYTE - START.BYTE = 1 THEN CASE3 = 2
4640     IF END.BYTE - START.BYTE > 1 THEN CASE3 = 3
4650 RETURN
4660 '  ------------------------------------------------------
4670 '
4680 '   This routine selects the proper routine for
4690 '         checking or setting availability based on
4700 '         the case defined by CASE1, CASE2, and CASE3
4710 '
4720 '            if start is before period...
4730     IF CASE1=1 AND CASE2=2 THEN ON CASE3 GOSUB 4880,4980
,4980
4740 '            if start and end are during period...
4750     IF CASE1=2 AND CASE2=2 THEN ON CASE3 GOSUB 5110,5280
,5240
4760 '            if start is during period but end is after..
.
4770     IF CASE1=2 AND CASE2=3 THEN ON CASE3 GOSUB 5460,5590
,5590
4780 '            if start is before and end is after period.
.
4790     IF CASE1=1 AND CASE2=3 THEN FIRST.BYT=1: LAST.BYT=LE
N(AVAIL$): GOSUB 5630
4800 '            the final case ends before or starts after p
eriod...
4810     IF CASE1=3 OR CASE2=1 THEN PRINT"Activity is complet
ely outside the period..."
4820 RETURN
4830 '  ------------------------------------------------------

4840 '
4850 '   --- This routine is used when END.BYTE$ is the
4860 '         first byte of AVAIL$...
4870 '
4880     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
4890     BYT.TO.CK$ = LEFT$(AVAIL$,1)
4900     GOSUB 5850
4910     IF AVAIL AND SET THEN MID$(AVAIL$,1,1) = CHR$(ASC(BY
T.TO.CK$) AND (NOT MASK))
4920 RETURN
4930 '  ------------------------------------------------------
4940 '
4950 '   --- This routine is used when END.BYTE points to
```

```
4960     '         end byte ..
4970 '
4980     FIRST.BYT = 1: LAST.BYT =  END.BYTE-1
4990     GOSUB 5730
5000     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
5010     BYT.TO.CK$ = MID$(AVAIL$,END.BYTE,1): J = END.BYTE
5020     GOSUB 5850
5030     IF AVAIL AND SET THEN GOSUB 5970 ELSE RETURN
5040     MID$(AVAIL$,END.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND (
NOT MASK))
5050 RETURN
5060 '  ---------------------------------------------------------
5070 '
5080 ' --- This routine is used for the single byte case
5090     '      where one byte includes both start and end...
5100 '
5110     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
5120     MASK = 0
5130     FIRST.BIT.USED = (START.BIT MOD 8)
5140     LAST.BIT.USED = (END.BIT MOD 8)
5150     GOSUB 5850
5160     IF AVAIL AND SET THEN MID$(AVAIL$,START.BYTE,1) = CH
R$(ASC(BYT.TO.CK$) AND (NOT MASK))
5170 RETURN
5180 '  ---------------------------------------------------------
5190 '
5200 '   --- This routine is used when one or more bytes
5210     '        separate the first and last bytes or when
5220     '        they are adjacent...
5230 '
5240     FIRST.BYT = START.BYTE+1: LAST.BYT = END.BYTE-1
5250     GOSUB 5730
5260     IF NOT AVAIL THEN RETURN
5270 '           CASE3 = 2 enters here...
5280     FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT USED =
7
5290     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
5300     GOSUB 5850
5310     IF AVAIL AND SET THEN MASK.ST=MASK: BYT.ST$=BYT.TO.C
K$ ELSE IF NOT AVAIL THEN RETURN
5320     FIRST.BIT.USED = 0: LAST.BIT.USED = (END.BIT MOD 8)
5330     BYT.TO.CK$ = MID$(AVAIL$,END.BYTE,1): J = END.BYTE
5340     GOSUB 5850
5350     IF NOT AVAIL THEN RETURN
5360     IF (CASE3=3) AND (AVAIL AND SET) THEN GOSUB 5970
5370     IF NOT(AVAIL AND SET) THEN RETURN
5380     MID$(AVAIL$,START.BYTE,1) = CHR$(ASC(BYT.ST$) AND (N
OT MASK.ST))
5390     MID$(AVAIL$,END.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND (
NOT MASK))
5400 RETURN
5410 '  ---------------------------------------------------------
5420 '
5430 '   --- This routine is used when the last byte in the
5440     '        string is the only byte to be checked...
```

```
5450 '
5460     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
5470     FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
(PERIOD.END.BIT MOD 8)
5480     GOSUB 5850
5490     IF AVAIL AND SET THEN MID$(AVAIL$,START.BYTE,1) = CH
R$(ASC(BYT.TO.CK$) AND (NOT MASK))
5500 RETURN
5510 ' ------------------------------------------------------------
5520 '
5530 '   --- This routine is used when the activity ends
5540 '         after the period and the first byte is one
5550 '         or more bytes from the end of AVAIL$.  The
5560 '         last two cases of CASE3 are both checked by
5570 '         this routine...
5580 '
5590     FIRST.BIT.USED = (START.BIT MOD 8): LAST.BIT.USED =
7
5600     BYT.TO.CK$ = MID$(AVAIL$,START.BYTE,1)
5610     GOSUB 5850
5620     FIRST.BYT = START.BYTE+1: LAST.BYT = LEN(AVAIL$)
5630     GOSUB 5730
5640     IF AVAIL AND SET THEN GOSUB 5970 ELSE RETURN
5650     MID$(AVAIL$,START.BYTE,1) = CHR$(ASC(BYT.TO.CK$) AND
 (NOT MASK))
5660 RETURN
5670 ' ------------------------------------------------------------
5680 '
5690 '   --- This routine is used by the routines above when
5700 '         whole bytes are being checked for
5710 '         availability...
5720 '
5730     FOR J = FIRST.BYT TO LAST.BYT
5740             BYT.TO.CK$ = MID$(AVAIL$,J,1)
5750             IF BYT.TO.CK$ <> CHR$(255) THEN FIRST.BIT.US
ED=0: LAST.BIT.USED=7: GOSUB 5850
5760             IF NOT AVAIL THEN RETURN
5770     NEXT
5780 RETURN
5790 ' ------------------------------------------------------------
5800 '
5810 '   --- This routine is called by above routines to
5820 '         check availability within partial bytes of
5830 '         AVAIL$...
5840 '
5850     MASK = 0
5860     FOR K = FIRST.BIT.USED TO LAST.BIT.USED
5870             MASK = MASK + 2^K
5880             IF (ASC(BYT.TO.CK$) AND 2^K) = 0 THEN AVAIL
= 0: RETURN
5890     NEXT
5900 RETURN
5910 ' ------------------------------------------------------------
5920 '
5930 '   --- This routine is called when a whole byte is to
```

```
5940      '          be set to NOT AVAILABLE state, both AVAIL
5950      '          and SET are TRUE...
5960 '
5970      FOR J = FIRST.BYT TO LAST.BYT
5980                MID$(AVAIL$,J,1) = CHR$(0)
5990      NEXT
6000 RETURN
6010 '
```

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